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PREFACE.

THIS work, though consisting of three distinct parts, is essentially one. The portion devoted to the Outlines of Mathematical and Physical Geography contains those broad facts and general principles upon which all Geography is based; and in the Second and Third Parts of the book constant reference is made to the truths established in Part I.

As a Text-book this manual will be found to differ in several respects from any hitherto published; and it may be as well, perhaps, to notice here some of these points of difference.

1. I have constantly endeavoured to bear in mind the different uses of a text-book and an atlas. It has been too much the practice hitherto to crowd Geographies with dry lists of names and columns of figures. Now, considerable experience in teaching has convinced me that these lists and figures are in a great measure useless, except for reference; and that a good atlas contains all that can be desired for this purpose.

2. Having, therefore, omitted a great amount of matter with which Geographies are usually encumbered, I have

had space to dilate on some points which are generally treated too slightly. It will be seen that upon the whole the *physical features* of any country described in this work are more fully dwelt upon than is usual in books so small. The principle that has guided me here, and which I think of considerable importance, is, that in order to learn Geography fully, the student should have clear definite ideas about the place of which he is reading. It is not sufficient that he know that there are certain mountains, rivers, and towns in any country; he ought to have the configuration of the surface clearly pictured out to his mind: he should know the precise direction in which the rivers flow, and the exact position of the towns on their banks.

3. I have also endeavoured to give a practical value to the information imparted in this work. I have endeavoured to connect the Geography of the British Empire with its every-day existence, with the proceedings in Parliament, and with the columns of the newspaper. In illustration of this statement I would refer to the remarks on the Future Prospects of India (p. 262), on the Atlantic Telegraph (p. 43), the Inter-Oceanic Railway (p. 294), the Hudson Bay Company (p. 293), Negro Emancipation (p. 291), and the War in New Zealand (p. 332).

I may remark, in conclusion, that though this book is expressly designed for Second Year's Students in our Training Colleges, yet I cannot but hope that it will have a wider circulation. It is far better to study a little geography well than a great deal superficially; and if we

must confine our attention to a smaller field than is usually done, what so worthy of our study as the Empire to which we belong? And in studying the British Empire we have this advantage, that, as it extends over every quarter of the globe, it furnishes us with examples to illustrate every principle in Physical, Political, and Commercial Geography.

In compiling this work, the authorities principally consulted have been Blackie's Imperial Gazetteer, M'Culloch's Dictionary of Geography, M'Culloch's British Empire, Great Britain by Long and Porter, Martin's Colonies, Manual of Geographical Science (published by Parker), Hughes' Manual, Guyot's Earth and Man, Maury's Geography of the Sea, Page's Text-book of Geology, and Mann's Guide to Astronomical Science.

W. L.

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PART I.

OUTLINES

OF

**MATHEMATICAL AND PHYSICAL
GEOGRAPHY.**

OUTLINES OF MATHEMATICAL AND PHYSICAL GEOGRAPHY.

CHAPTER I.

FORM AND MAGNITUDE OF THE EARTH.—METHODS OF FINDING LATITUDE AND LONGITUDE.

THE earth is an immense ball, isolated in space.—We know that the earth is isolated in space, because travellers have gone round it. Ships have set out from different parts, and, continuing in the same general direction, have at length returned to the place from which they started. We know also that the shape of the world is round. The common argument drawn from the appearance presented by a ship, when leaving or approaching the shore, is as true as it is familiar. The shadow of the earth as seen in an eclipse shows, also, that the earth is a globe; and if additional proof be needed, it may be remarked that the visible horizon, or boundary of our vision, is always a circle, and this could not be the case if the earth were not a sphere. Nor do the various elevations and depressions upon the earth's surface interfere with the spherical shape of it considered as a whole. This will be evident when the magnitude of the earth is considered. It will be shown afterwards that the diameter of the earth, that is, the measure *through* it, is about 8000 miles; now, as the highest mountain does not rise six miles above the sea level, such an elevation bears no greater

proportion to the whole globe than a grain of sand to a globe 12 inches in diameter.

The earth is, then, an immense globe or ball. An imaginary straight line passing through its centre, and terminating each way at the surface, is called its **Diameter**; the two points on the surface where the diameter terminates are called **Poles**,—one is called the north pole, and the other the south pole; and a circle drawn round the globe, at an equal distance from each pole, is called the **Equator**. A circle drawn right round the earth, either at the equator or passing through the poles, is called the **Circumference**. Every circle may be divided into 360 equal parts called degrees; the circumference of the earth therefore contains 360 degrees; and if we could determine the length of one of them, we could find out the circumference of the earth. This has been done, and it is found that the *average* length of one degree is $69\frac{1}{8}$ miles. Measuring degrees is very difficult work, but the general principle may be easily explained.

The sky always appears to an observer like half a hollow sphere. The point directly over the observer's head is called the **Zenith**; the boundary of his vision, or the line where the earth and sky appear to meet, is called the **Horizon**. A line drawn through the zenith and terminating in opposite points on the horizon would be a semicircle, and would contain of course 180 degrees—usually written 180° ; half the semicircle, or the part between the horizon and the zenith, will contain therefore 90° . Turning now once more to our globe, we mentioned that a circle drawn right round the globe through both poles would be the circumference, and that it would contain 360° . That portion of it between the equator and either pole would be a fourth of a circle, and would contain therefore 90° ;—the same number as was contained in the arc between the zenith and the horizon. If our observer were stationed at the equator, on a clear evening, he would see three stars near his zenith. They are in the constellation of Orion, and may often be seen

in this country in the south part of the sky. On casting his eye northwards, our observer would see the pole star—so familiar to us—just on the horizon. If now he were to journey towards the north, he would find that, owing to the convexity of the earth, the pole star would appear to rise gradually in the heavens, or increase in altitude, while the three stars in Orion's belt would appear to descend. And if it were possible for him to reach the north pole, he would find the pole star then in his zenith, and the three stars of Orion on the horizon, or, in other words, while he had travelled over 90° on the earth's surface, a certain star had appeared to rise 90° in height, while three others had descended the same number of degrees. From other observations with different stars he would find that the same principle held in every case. Putting, therefore, this important conclusion into a general form, we find that, *if we travel over any number of degrees on the earth's surface to the north or south, some stars will appear to rise and others to descend the same number of degrees.*

The distance travelled over can be accurately measured by a process called **Triangulation**. In the first place, a base line has to be computed. A piece of firm level ground is selected, and a straight line eight or ten miles in length is measured by means of rods of brass or iron. As metals expand by heat, various contrivances are used to protect the rods from changes of temperature, and in some cases they are covered with canvass tents. Base lines have been measured in different parts of the British Islands, but the one most frequently referred to is measured along the sandy shore of Loch Foyle. After the base line has been measured—and this is done with such accuracy that sometimes in a distance of several miles the error is not supposed to exceed the fraction of an inch—the next step is to fix upon some distant object which can be distinctly seen either by the eye or by means of a telescope. The angle which this object makes when viewed from each extremity of the base line is then deter-

mined by means of a theodolite, and a triangle is thus constructed, the remaining two sides of which can be easily calculated. Each of these sides may now form the base of another triangle, and in this way the whole country may be divided into a number of large triangles, and the length of a straight line passing through these triangles may be computed. By the means we have described a meridian has been measured extending from Shanklin Down, in the Isle of Wight, to Balta in the Shetland Islands. Suppose, then, we could, as was explained in the last paragraph, measure the number of degrees passed over in travelling from the north to the south of Britain, and by means of triangulation could reduce this distance to miles, we might in this manner obtain the length of a degree. This has been done, not only in the British Islands, but in South Africa, in India, Russia, France, Lapland, Peru, and other places; and the average length of a degree is found to be $69\frac{1}{10}$ English miles. We say the average length, because as we approach the poles it is found that the degrees gradually lengthen; and from this circumstance it is concluded that the earth is not a perfect sphere, but is slightly flattened at the poles: the consequence of this being that the polar diameter is about 26 miles shorter than the diameter at the equator. As the length of a degree is about $69\frac{1}{10}$ miles, the circumference of the earth is about 24,876 miles, and its diameter 7912 miles nearly.

Latitude.—The position of any place upon the surface of the earth may be at once determined when its latitude and longitude are known. The former gives its distance, north or south, from the equator; the latter, its distance east or west of a certain point fixed upon;—in England the point agreed upon is Greenwich. The latitude of a place may be determined by observing the stars. It was mentioned in a preceding paragraph that an observer stationed at the equator would see certain stars in his zenith; and that as he proceeded towards the north—and we may add towards the south—these stars would

appear to descend gradually. Now, if at any time he could find the distance of these stars from the zenith, in degrees, this would give him his distance in degrees north or south of the equator,—in other words his latitude. It will be evident that the same result might be obtained by finding the distance of the pole star above the horizon. Sometimes latitude is found by observing the altitude of the sun : for at certain periods of the year it shines directly upon the equator, and then the method of proceeding is precisely the same as with the stars. At other times, however, as we know, the sun is north or south of the equator, and then its *declination*, or distance north or south of the celestial equator—an imaginary line in the sky corresponding to the equator of the earth—must be taken into account. On the twenty-first of June, the sun is $23\frac{1}{2}^{\circ}$ north of the equator; and on the twenty-first of December, as far south of it; therefore the distance of the sun from our zenith, if taken at either of these periods, would not give our distance from the equator, but our distance from the *tropic of Cancer*, in June; and from the *tropic of Capricorn*, in December: and to get our true latitude we should have to add $23\frac{1}{2}^{\circ}$ in the first case, and deduct it in the second. The declination of the sun for every day in the year can be calculated beforehand, and is published in the *Nautical Almanac*; so that, if an observer at any place, on any day, could take the altitude of the sun, and then, by means of the tables referred to, make the necessary correction, he would at once determine the latitude of the place where he then was.

Longitude.—If we know the difference of *time* between any two places we know the difference in their longitude. The time of any place is regulated by the sun. When the sun is at its highest point in the sky, or, as it is termed, on the meridian, then it is mid-day: and as the sun rises in the east and moves completely round the earth in 24 hours, it is mid-day successively to every spot on the earth's circumference in that time. Places situated to the east will have mid-day sooner than

those to the west; and if we knew the distance any place was to the east of another, we could tell how much sooner it would have sunrise, noon, and sunset. As we have before mentioned, the circumference of the earth may be divided into 360° , and as the sun moves round the entire circle in 24 hours, it will move over 15° in an hour, or one degree in four minutes. Suppose, then, a ship set out on a voyage carrying with it a marine chronometer set to Greenwich time. If in the course of a month or two it was observed that, when the sun was on the meridian, the chronometer only pointed to eleven, it would be at once concluded that the place where the observation was taken was an hour before Greenwich time, and therefore 15° farther east. If the chronometer pointed to two o'clock, it would be equally certain that the place was 30° west of Greenwich.

Of course, every thing depends upon the accuracy of the chronometers, and therefore every precaution is taken in their construction, so as to provide for variations which might be caused by changes in temperature and shocks received by the vessel. Still they cannot be made quite perfect, and therefore another and more usual way is to notice the exact time of the eclipses of the sun and moon, or the occultation of stars, or especially the eclipses of Jupiter's satellites. Some one or other of these phenomena takes place daily, and the exact time when they occur is calculated for years beforehand, and marked down in the *Nautical Almanac*, in Greenwich time. If, then, an observer finds that the eclipse, or occultation, takes place—say twenty minutes past seven, instead of seven, the time given in the almanac,—he at once concludes that he is five degrees east of Greenwich.

The lines of latitude are sometimes called **Parallels**, because they consist of circles drawn parallel to the equator, and of course these circles diminish as they approach the poles. The lines of longitude are called **Meridians**, because all places through which they pass have mid-day (*meridies*) at the same time. These merid-

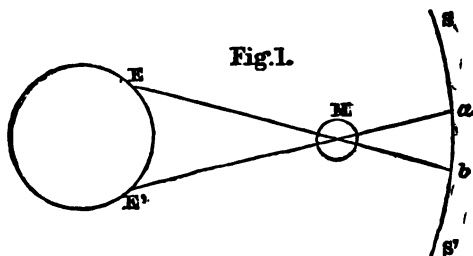
ians consist of semicircles of equal length passing from pole to pole; and one is fixed upon from which the others are measured east and west. In England, as has been before stated, the meridian of Greenwich is the one fixed upon; on the Continent each country generally reckons from the one passing through its capital. As the meridians all terminate in the poles, the degrees of longitude diminish as they approach the poles, while the degrees of latitude are everywhere of almost equal length (vide p. 6). The latitude and longitude of most places upon the earth's surface have been calculated, and maps of the world and of different parts of it, have thus been constructed. In those made according to *Mercator's projection*, the parallels and meridians are drawn as straight lines, instead of being curved; but these are rather *charts* than maps: it is not intended that the distribution of land should be accurately represented, but only currents of the air and ocean, and other facts connected with physical geography.

CHAPTER II.

DISTANCE AND MAGNITUDE OF THE MOON—OF THE SUN.
—DIURNAL AND ANNUAL MOTIONS OF THE EARTH.—
ABERRATION OF LIGHT.

It will be necessary here to say a few words about *parallax*. *Parallax* may be defined as the apparent change in the position of a heavenly body caused by a real change in the position of the observer. Let $E-E'$ represent a portion of the surface of the earth; M , the moon; and the curved line $S-S'$, a portion of the sky. If the moon be observed from E , it will appear to be among the stars at b ; if from E' , it will appear to be at a . The arc a, b , or the angle a, M, b , represents the amount of *parallax*. Now, as this angle is the same as the angle

E M E', we may change the form of our definition, and describe **parallax** as the angle made by two lines of



vision formed by viewing a heavenly body from two different positions. **Horizontal parallax** is the angle formed by two lines of vision, one proceeding from an observer viewing the object when it is upon the horizon, and the other from an observer supposed to be at the centre of the earth. In finding the parallax of the moon, observations are generally taken at the same time at the Cape of Good Hope, and at Greenwich, or some other observatory in Europe. After some necessary corrections have been made, the *horizontal parallax* is calculated, and this is found to be about 57 minutes and 2 seconds, and from this the distance and magnitude of the moon can be determined. In order to explain this we must first speak of the unit of circular measure.

In an angle of 60° , as is well known, the chord of the arc is equal in length to the radius; but in an angle of little more than 57° , the arc itself is equal to the radius, and this particular angle is called the **Unit of Circular Measure**. If the angle be diminished, of course, the arc will be diminished also, but the radius always remains the same. Let us apply these facts to the horizontal parallax of the moon. Let M be the moon; A, the position of an observer when the moon is on the horizon; B, the centre of the earth. A, M, B, may be looked upon as part of an immense circle of which M A, M B,

are the radii, and AB the arc; for, in an angle so small as is the horizontal parallax of the moon, the straight line

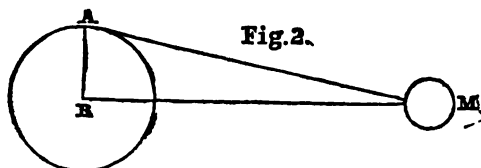


Fig.2.

AB may be considered an arc, without materially affecting the calculation. The horizontal parallax of the moon is, as we have said, $57' 2''$; that is, about one-sixtieth part of the unit of circular measure; therefore, since the arc diminishes with the angle while the radius remains the same, the arc AB must be one-sixtieth of the radius AM . But the arc AB is the radius of the earth, which we have seen before (p. 6) is about 4000 miles; the distance of the moon, then, must be 60 multiplied by 4000, that is, 240,000 miles.

By a similar process the magnitude of the moon may be calculated when its distance is known. In figure 3,

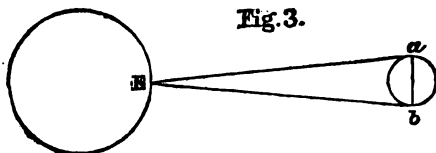


Fig.3.

let E be any point on the earth's surface; and $a-b$, the apparent diameter of the moon. On careful measurement it is found that the apparent diameter of the moon is about half a degree, that is, about a one-hundred-and-twentieth part of the unit of circular measure. The arc $a-b$, therefore will be about a one-hundred-and-twentieth part of the radius aE . But $a-b$ is the diameter of the moon; and aE is its distance from the earth; therefore the diameter of the moon is about a one-hundred-and-

twentieth part of the moon's distance from the earth, and as this distance is about 240,000 miles, we conclude that the diameter of the moon is about 2000 miles. And since the magnitudes of spheres are to each other as the cubes of their diameters, it follows that the earth is 64 times the size of the moon.

The horizontal parallax of the sun may be determined in the same manner as that of the moon, but as the angle is very small the slightest inaccuracy affects the calculation considerably: other and more refined methods must therefore be adopted. It would be out of place for us to enter here upon these methods and calculations, and therefore we shall merely state that the parallax of the sun has been found to be about 8.6 seconds. The horizontal parallax of the moon is thus about 400 times larger than that of the sun, and therefore we conclude that the sun is 400 times farther from us. And since at this great distance the apparent diameter of the sun is about equal to that of the moon, it must in reality be 400 times greater. The diameter of the moon we have seen is about 2000 miles; the diameter of the sun must therefore be about 800,000 miles; that is, 100 times greater than that of the earth. The magnitude of the sun must therefore be one million times that of the earth. It may be added that none of the fixed stars have the slightest horizontal parallax, and therefore their distance must be much greater than that of the sun even.

We have hitherto spoken of the sun as if it moved round the earth once in 24 hours; let us, however, reflect upon this. The sun, it appears, is about 400 times farther distant from us than the moon is,—that is, about 95 million miles. If, then, the sun moves round the earth, it must every day describe a circle 600,000,000 miles in circumference: What, then, must be the velocity with which it moves? And what must be the velocity of the stars, which are still further distant? Such a supposition, then, is exceedingly improbable, and we may add, according to the laws of gravitation, impossible. We must, there-

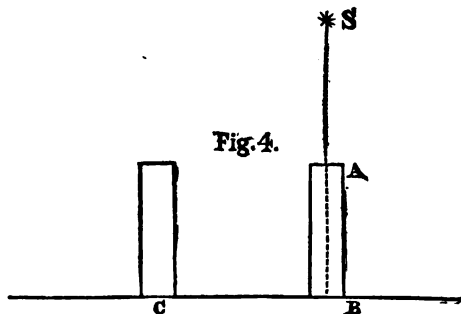
fore, account for the apparent daily motion of the sun and stars in some other way, and we find that the phenomena would be exactly the same, if the sun and stars were stationary, and the earth turned round once every day upon its own axis. It is true we do not feel this motion, because it is so smooth and uniform, but there are, as we shall see hereafter, certain effects produced upon winds and oceanic currents which cannot be explained unless we suppose the earth to have a diurnal motion. But, indeed, this motion has been placed beyond a doubt by an ingenious experiment with the pendulum; however, to understand this would require a considerable knowledge of mathematics, and therefore a more familiar proof may be given.

It has been observed that if a stone be dropped from the top of a very high tower, it does not fall close to the base, but a little to the east of it: and this is the explanation given. The earth, in turning on its axis from west to east, carries the tower along with it: but as the top of the tower describes a larger circle than the bottom of it, it must move a little quicker. The stone which is dropped partakes of the motion of the top of the tower, and therefore, when it reaches the ground, as it was moving towards the east rather quicker than the base was, it falls a little in advance of it. This experiment has been performed in a most satisfactory manner, and is a convincing proof of the earth's daily rotation.

It appears, then, that the apparent daily motion of the sun and stars from east to west is due to the diurnal motion of the earth upon its own axis from west to east. From the time that the sun appears upon the meridian, until he comes upon the same meridian again, is 24 hours. But if we notice the stars carefully we shall find that they come to the same meridian again in 23 hours, 56 minutes. It would appear, then, as if the earth really took only 23 hours, 56 minutes, to turn once upon its axis, but that in the meantime the sun had moved a little to the east, and it took the earth 4 minutes more to

bring the proper meridian under it. This fact was noticed by the ancients; they observed that the sun appeared to step a little to the east every day, and thus change his place among the stars,—for every one will have noticed that the same stars do not appear every evening—and that in a year the sun came round to its original position. They gave the name of **Degree** to the distance moved eastward by the sun each day; and as the year then consisted of 360 days, we can see how it happened that all circles came to be divided into 360 degrees. But does the sun move at all? Its daily motion from east to west is only *apparent*: May not this annual motion be merely apparent also? Now, it may be shown that the appearance presented by the sun moving among the stars would be the same whether we suppose the earth to be stationary and the sun to move round it, or the sun to be stationary and the earth to move round the sun. Certainly, the second supposition is the more probable one, when we consider the relative sizes of these two bodies: and this *probability* amounts to *certainty* when we consider the **Aberration of light**.

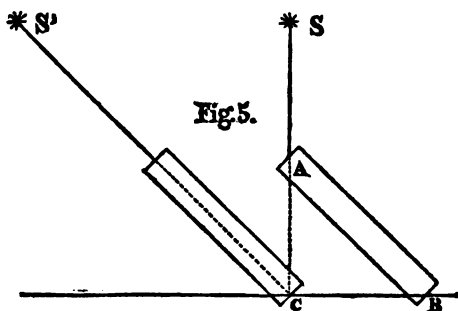
Let S be a star in the zenith, and A B the tube of a telescope. Light, we know, travels with great velocity,



since it comes from the sun to the earth in eight minutes. Yet, rapid as the motion is, it will require some time—

though an exceedingly minute quantity—to pass down the tube of the telescope from A to B. If now the earth were at rest, the telescope would be so too, and it would not matter how long the ray of light was in passing from A to B, we should see the star in looking through the tube. If, however, while the ray was passing from A to B, the tube was moved to C, by the motion of the earth, the light would strike against the side of the tube, and the star would be invisible; and in order that we might see the star, the tube would have to be inclined a little.

Thus, in figure 5, we will suppose the tube inclined in the direction A B. Then, if while the ray of light was passing from A to C, the telescope was moved on from B to C, the ray would reach the eye of the spectator at C. And as an object always appears in the direction in which the ray of light appears to come, the star, instead of appearing to be in its true position S, would appear to be at S', a little in advance of its true position. If, then, the



earth has an annual motion, stars when viewed through a telescope will not appear in their real positions, but a little in advance of them; and as this will be the case from whatever part of the earth's path round the sun they are viewed, it follows that stars in the zenith will appear to describe minute circles round their real positions, the

radius of these circles being the space between their real and their apparent positions. Now, such is really the case. Bradley, the astronomer, when endeavouring to find out the annual parallax of certain stars, found that they were not *fixed* as he before imagined, but that they revolved in very minute circles. This phenomenon, which he termed the *aberration of light*, he soon convinced himself was owing to the annual motion of the earth; and the existence of this motion, therefore, may be looked upon as settled.

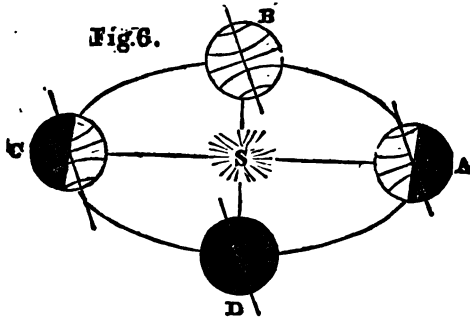
CHAPTER III.

THE SEASONS.—DIFFERENT LENGTHS OF DAY AND NIGHT.
—EQUATION OF TIME.—FIXED STARS.

The earth, then, has two motions;—one, a diurnal motion round its own axis; and the other, an annual motion round the sun. The imaginary path which the earth takes in moving round the sun is called its *Orbit*; and the space included is called the *Plane* of the earth's orbit. The path traced out in the sky by the sun's apparent annual motion is called the *Ecliptic*: this does not coincide with the celestial equator (vide p. 7), for sometimes it is $23\frac{1}{2}^{\circ}$ north, and at other times $23\frac{1}{2}^{\circ}$ south of it. The reason of this is, that, in moving round the sun, the axis of the earth is not perpendicular to the plane of its orbit, but makes with it an angle of $66\frac{1}{2}^{\circ}$. This inclination of the earth's axis is the cause of the seasons.

In the accompanying figure, let S represent the sun, and A, B, C, D, the earth in four different positions in its orbit: the four straight lines are the prolongation of the earth's axis, and are always parallel. When the earth is at A, the upper or north pole is inclined to the sun, and the sun's rays strike perpendicularly upon the tropic of Cancer,—an imaginary line drawn round the earth $23\frac{1}{2}^{\circ}$ north of the equator. At C, the vertical rays of the sun strike upon the tropic of Capricorn,—an imaginary line

south of the equator corresponding to the tropic of Cancer. In the other two positions neither pole is inclined, and the sun is then perpendicular over the equator. When



the sun is at A, it is summer in the northern hemisphere: at B, it is autumn: C, is its position in the middle of winter; and D, its position in spring. We may now explain how it is that the lengths of night and day vary with the seasons.

If we hold a globe up before a candle we see that only one-half of it can be illuminated at the same time. It is so with the earth, only one-half of it can be lighted up at the same time by the rays of the sun; the other half is in darkness. The line which separates the light part from the dark part is called the **Circle of illumination**. When the earth was in the position A (figure 6), the sun shone directly over the tropic of Cancer: this point, therefore, must be the centre of the illuminated half, and the circle of illumination would stretch $23\frac{1}{2}$ degrees on the other side of the north pole, but would not reach the south pole. As the earth turned upon its axis, all parts of its surface that came within the circle of illumination would have day; all beyond it, night; and it will be seen that so long as the earth remained in this part of its orbit, a space round the north pole within the *arctic circle*—an

imaginary circle drawn round the earth $23\frac{1}{2}^{\circ}$ distant from the north pole—would have continual day, while a space round the south pole, within the *antarctic* circle, would have continual night. At C the reverse of this would take place; the north pole would be shrouded in darkness, while the south pole would have one long day. When the earth is at B, or D, then, since the sun shines at these periods directly over the equator, the circle of illumination will pass through the poles, and days and nights will be of equal length, and the same for all parts of the world. These two positions in the earth's orbit are hence called *Equinoxes*,—a word meaning equal nights. As both the equator and the circle of illumination are *great* circles, that is, each of them divides the surface of the earth into two equal portions; and as great circles always bisect each other, the circle of illumination must always bisect the equator, and days and nights at the equator are therefore equal throughout the year: it is for this reason that the equator is sometimes termed the *Equinoctial line*. As we recede, however, from the equator, the days and nights become of unequal length, until at the pole there are "days and nights for half a year." We have before remarked, that during our summer, the sun, when on the meridian, appears each day to approach nearer and nearer to the zenith until he attains a certain altitude; for awhile he appears stationary, and then descends lower and lower each day until about the 21st December, when he has reached his lowest altitude, and, after being again stationary for awhile, again turns northward. The two periods when he appears stationary are called *Solstices*, a word meaning the standing of the sun; and the imaginary circles drawn through the extreme points reached by the sun in summer and winter respectively, are called *Tropics*, from a Greek word signifying *to turn* (see p. 16).

Between the summer solstice—when the earth is in the position A—and the autumnal equinox, and so on until winter, the days shorten and the nights lengthen in all parts of the northern hemisphere; but between the

winter solstice (position C) and the vernal equinox, and so on to mid-summer, the days lengthen. When we consider this, and recollect at the same time, that in summer the rays of the sun are more vertical than in winter, owing to its greater altitude, we have no difficulty in accounting for the much higher temperature felt during summer than during winter. But curious as it may appear, the sun is actually nearer to us in winter than in summer. The earth's orbit is not a perfect circle, but an ellipse, and in winter it is about three million miles nearer the sun than in summer. But as the distance between the earth and the sun lessens, the velocity of the earth moving in its orbit increases, and thus the interval between the autumnal and vernal equinoxes is about eight days shorter than that between the vernal and autumnal equinoxes, and this compensates for the earth's nearer approach to the sun: for Sir John Herschel shows that during the former and shorter interval, the earth receives exactly the same amount of heat from the sun as it does in the latter and longer interval—(vide *Astronomy*, p. 198).

Equation of Time.—We have already mentioned (page 13) that the time required for any star which is upon the meridian to come again to the meridian, is four minutes less than 24 hours—the time required by the sun; the former interval is called a *sidereal* day, the latter a *solar* day, and in the ordinary business of life we make use of solar time. But solar days are not all of equal length: for as the difference between a sidereal day and a solar day is owing to the earth's annual motion, and as this motion is not always uniform but sometimes quicker than at other times, it follows that the solar days will vary in length; and we should expect them to be rather more than 24 hours from the autumnal to the vernal equinox, and rather less from the vernal to the autumnal equinox. But there is also another cause at work which disturbs the length of the solar day—the sun's apparent motion in the ecliptic. The ecliptic, it has been before observed, does not coincide with the celestial equator, but is inclined

to it at an angle of $23\frac{1}{2}^{\circ}$ (p. 16). If, therefore, the earth's motion in its orbit were uniform, the effect of the obliquity of the sun's apparent path would be to cause a difference in the lengths of solar days. For at the solstices the ecliptic is parallel with the equator, while at the equinoxes it is very oblique. We can see, therefore, that as the sun moves along the ecliptic about a degree every day, the space moved towards the east, as measured on the *equinoctial*, or celestial equator, would be greater at the solstices than at the equinoxes. Hence this cause alone would produce some irregularity in solar time, and the two causes combined make the solar day to vary about 50 seconds. Now, as it is very desirable that in the ordinary business of life, our days should be of uniform length, we take the average length of a solar day for our purpose: this is a *mean solar* day, and of course is 24 hours long. The difference in the length of solar days never exceeds 51 seconds, but as the excess or deficiency continues to accumulate for several days, there is sometimes as much as 16 minutes, 18 seconds difference between noon as marked by the sun's passage across the meridian, and the proper noon of *mean solar* time. This difference is called the *equation* of time; it is calculated beforehand for every day in the year, and is often published in common almanacs. In order to make use of the table, we should notice the exact amount of equation given for any particular day, and also, whether the sun is before the mean time or after it: then, having noted the exact time on the sun-dial, should take out our watch and put it the exact time before or after the sun, as the case may be.

It will be evident that we have hitherto only spoken of *local* time, for other places will have noon at a different time from us, just as they are to the east or west of us (vide p. 7). Astronomers, however, sometimes find it convenient to have some fixed instant, to reckon time from, common to all the world. This is done by reference to the motion of the sun or moon among the stars: time so reckoned is called *equinoctial* time.

Fixed Stars.—It was mentioned before (page 16) that Bradley discovered the aberration of light when endeavouring to find out the annual parallax of certain stars; it may perhaps be as well to say a few more words on this subject. We have already seen that it is difficult to determine accurately the horizontal parallax of the sun, as the angle is exceedingly small; and that it is impossible to detect any horizontal parallax of the fixed stars owing to their immense distance. It was next tried to find out an **Annual parallax**, by observing a star from two opposite parts of the earth's orbit, and thus the arc of the angle would be 190 millions of miles, instead of 4000 as in the former case. In the southern hemisphere there is a bright star in the constellation of the Centaur, the annual parallax of which is about two seconds: adopting the same means of calculation as was used in finding the distance of the moon (page 10), we find that this star must be 200,000 times further distant than the sun; and, so far as we have yet learned, this is the nearest to us of all the fixed stars.

Now, it has been calculated that the sun at the distance of this star would only shine with one-half of the star's brilliancy; hence it is probable that the star is itself a sun, and much larger than the centre of our system. The parallax of about eight other stars has been discovered, and the distance and probable size of each computed in a similar manner; and one of these, Sirius—the Dog-star—is supposed to be at least sixty times the size of the sun. Each of the stars visible to the naked eye, and many more which can only be seen through a telescope, is probably the centre of a system of planets, just as the sun is the centre of the solar system. This opinion is strengthened by the fact that some stars exhibit variable light at regular intervals; for this phenomenon can only be accounted for in two ways,—either these stars turn round on their own axes and have a bright and a dark side, or they have large opaque bodies revolving round them, which at regular intervals partially eclipse them.

In some cases it has been discovered that two or even three stars revolve round each other, though at immense distances apart; and it is now generally admitted that our sun itself revolves round some centre as yet unknown, its velocity being about 154,000,000 miles in a year. From this rate it has been calculated that the immense orbit in which it moves is about five million times wider than that of the earth.

CHAPTER IV.

MOTIONS AND PHASES OF THE MOON.—ECLIPSES.—TIDES.

The moon moves round the earth just as the earth does round the sun; this journey it performs in 27 days, 7 hours, 43 minutes, and $11\frac{1}{2}$ seconds, and as the face presented to the earth is always the same, we conclude that it turns once upon its own axis during the same interval. As the brightness of the moon is only the reflected light of the sun, and since the sun can only enlighten one-half the surface of the moon at the same time, it follows that the moon will present different appearances to us, as its position in its orbit changes. When on the opposite side of the earth to the sun, that is, when it comes on the meridian at midnight, then the whole of the illuminated side is turned towards the earth, and we have what is called *full moon*. When the earth, moon, and sun are in conjunction,—that is, when the moon is on the same side of the earth as the sun is, and therefore rises and sets with it,—then the dark side is turned to the earth, and therefore it is invisible: it is then *new moon*. Midway between new and full moon, or full and new moon, we see half the illuminated side, and then the moon is said to be in her quarters. Between new moon and her first quarter, the moon is *Crescent*; between full moon and her quarters, the moon is *Gibbous*. The word *crescent* means

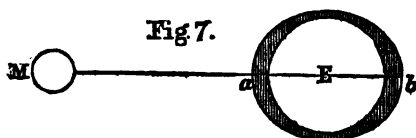
increasing; *gibbous* means hunchbacked. The different appearances which the moon presents in different parts of its orbit are termed **Phases**, from a Greek word, signifying appearance.

The moon, we have said, completes a revolution round the earth in little more than 27 days; this interval is called a sidereal month. A *lunar* month, that is to say, the interval between new moon and new moon again, is a little longer than this, being 29 days, 12 hours, 44 minutes, 3 seconds. The reason is this:—while the moon has been going round the earth, the earth has moved some distance forward in its own orbit, and consequently it takes rather more than two days for the moon to move on, in order to come again in a line with the earth and the sun, as it is in new moon.

Eclipses.—When the moon comes directly between the earth and the sun so as to intercept its light, then there is an eclipse of the sun: and when the earth comes between the sun and the moon so as to prevent the rays of light from reaching the moon, then there is an eclipse of the moon. The dark shadow which appears on the sun's disc during a solar eclipse is the shadow of the moon, and the dark shadow upon the moon's disc during a lunar eclipse is the earth's shadow; and as this shadow, or at least so much of it as is seen, is always circular, this affords one among other proofs that the earth is round (vide p. 3). From what has just been said, we might naturally expect that there would be two eclipses every month; one at new moon and the other at full moon. This would be the case if the *plane* of the moon's orbit coincided with the plane of the earth's orbit, for then at full moon and at new moon, the sun, the earth, and the moon would be in one straight line: but the plane of the moon is *inclined* to the plane of the earth at an angle of 5°, and hence at full and new moon the moon is sometimes above and sometimes below the sun. The question next arises—How is it, then, that there are ever any eclipses at all? In order to answer this question, we

must say a little about the moon's *nodes*. The plane of the moon's orbit, we have said, is inclined to that of the earth's, at an angle of about 5° . The two points where the orbit of the moon cuts the plane of the earth's orbit are called **Nodes** (Latin *nodus*, a knot): these nodes are not stationary, but move about, and sometimes one of the nodes may come between the earth and the sun; and, of course, when that is the case the moon in going round its orbit will come between the earth and the sun, and just as it sometimes comes directly between the two, and sometimes only partially so, so there is sometimes a total eclipse of the sun, and sometimes only a partial one. The same remarks, of course, apply to the other node, and to the eclipse of the moon.

Tides are due principally to the attraction of the moon. The attraction of gravitation is a property of all matter; and as the earth attracts the moon and keeps it in its orbit, so the moon attracts the earth; and one result of this attraction is the formation of tides. Let E be the earth and M the moon; and, for the sake of clearness, let



us first suppose the earth to be entirely surrounded with water *a b*. Then the moon (M), in exerting its attractive power, will draw the water at *a* more than the earth itself: for the particles of water move over each other easily, while the earth, being a solid mass, must move all at once. Thus, on the side next the moon, the waters at *a* will be heaped up, and a tide will be formed. And as each place on the surface of the earth is brought successively under the influence of the moon in 24 hours, we might expect that there would be one tide each day everywhere. But there are *two* tides each day: the

reason of this we will briefly explain. Referring again to our diagram, we see that the moon attracts the water at *a* more than the earth (E) itself; but it also attracts the earth more than the water at *b*, because the centre of the earth is nearer to it. Hence, the earth is drawn away from *b*, and the water, being left behind, appears bulged up on that side. Thus we see there are two tides always formed at the same time, on opposite sides of the earth; and thus it is, that every place has two tides in 24 hours.

The moon is the principal agent in forming the tides; for although the absolute attraction of the sun is greater, yet the difference of its attraction for different parts, as *a* and E, for example, is not so marked as in the case of the moon, and it is upon this difference that the height of the tides depends. When the sun and moon are in conjunction, as at new moon, or in opposition, as at full moon, then the tides are greatest, and are called **Spring tides**. For, if the sun and moon are on the *same* side of the earth, they both pull the same way, and their attractive power is united; if they are on opposite sides of the earth, they pull two opposite ways, yet still they assist each other, for each contributes its share in forming both the tides. When, however, the moon is in her quarters, and exerts her influence in a line at right angles to the direction of the sun's attraction, then the two forces counteract each other, and the tides are low: these tides are called **Neap tides**.

If the earth were covered by an ocean of uniform depth, the crests of the tidal wave would travel round it every day in regular succession, following the course of the moon from east to west. But it is only where there is a very great expanse of water that a real tidal wave can be formed; and as the largest expanse upon the globe is in the South Pacific Ocean, many scientific persons think that there alone is there a real tidal wave, and that the tides felt in other parts of the world are merely *derived* waves, similar in character to the ripple in a stream caused by throwing in a stone.

The Tidal Wave.—Suppose, then, a tidal wave is formed in the South Pacific, an impulse will then be given to the mass of waters around. In 12 hours this impulse is felt at Van Diemen's Land; in 12 hours more the high crest of wave stretches across the Indian Ocean, one extremity reaches Hindostan, the other is not far from the Cape. An interval of 12 hours more brings one extremity of the wave to Newfoundland, the other to Cape Blanco, on the west coast of Africa. Bending now to the east, the wave crosses the Atlantic, and in four hours reaches the mouth of the English Channel. Here the wave divides, one branch creeps slowly up the English Channel, another proceeds northwards, rounds the north of Scotland, and in eight hours reaches Aberdeen. It now proceeds slowly to the south, bringing high water successively to different ports on the east coast of Great Britain, and in twelve hours more reaches the mouth of the Thames. The wave that proceeded up the Channel travels very slowly, on account of the shallowness of the water, and only reaches the mouth of the Thames after an interval of eight hours; it then proceeds to the north, and in the neighbourhood of the Wash meets the other branch. A third branch from the Atlantic wave proceeds up St George's Channel and the Irish Sea, and in six hours reaches the Solway Frith. A glance at the map of Great Britain will show that on the east coast, from Duncansbay Head to the Wash, the inlets for the most part open to the north-east; while, on other parts of the coast, with one or two exceptions, which may be accounted for, the inlets are turned to the south. This may be owing to the fact that the tidal wave proceeds south from the Pentland Frith to the Wash, but on the other parts of the coast advances northward. Professor Airy, while admitting that the tides round the British coasts are derived waves, doubts whether the oscillations commenced in the South Pacific would be felt so far away from their source, and thinks it more likely that the disturbance originates in some part of the Atlantic basin.

The exact time at which high water occurs at any port, after new or full moon, is called the *establishment* of the port, and when this is once known, the time of high water, on any other day, may be calculated. For the tides follow each other regularly, with intervals of 12 hours and 25 minutes between. On a preceding page it was said that there are two tides in 24 hours; strictly speaking, we should say in 24 hours, 50 minutes. If the moon were stationary, the earth, having turned once round, would present the same meridian to it again in 24 hours; but in the meantime the moon has travelled 12 or 13 degrees onwards in its orbit, and the earth must turn a little more to the east to bring the moon upon the meridian; and the time required to do this is 50 minutes. On the south coast of England, Poole Harbour exhibits the curious phenomenon of two tides in 12 hours. The tidal wave flows regularly for 6 hours, it then ebbs for $1\frac{1}{2}$ hours; it then flows again for $1\frac{1}{2}$ hours, and ebbs during the remaining three hours. The second flow seems to be owing to the peculiar position of the entrance to the harbour. Being turned towards the east, it receives the waters of the ebb tide coming from between the mainland and the Isle of Wight. This causes a flow within the basin until the water outside is below the level of that within, when it again begins to ebb, and continues to do so until low water. A similar occurrence often takes place in the Frith of Forth, near Clackmannan, and is known to seamen as the "leaky tides."

The tidal wave moves quickest in deep water; in narrow shallow channels the wave travels slowly, and the waters accumulate; in the Bristol Channel and the Bay of Fundy, the tide has been known to rise 70 feet: and in the Bay of St Malo, on the north coast of France, it sometimes reaches 50 feet. Often at the mouths of rivers the tidal wave forms what is called the **Bore**. This is caused when either the shallowness of the water or the narrowness of the channel causes the first portion of the tidal wave to move so slowly that the succeeding waters

accumulate perpendicularly. The bore in the river Hooghly at Calcutta is five feet high, that at the mouth of the Severn, nine; and at the mouth of the Amazon, 12 feet. There is a graphic account of the "eagre," or bore of the Tsien-Tang river, in China, given in a note to Maury's Physical Geography of the Sea, sec. 916.

CHAPTER V.

THE CRUST OF THE GLOBE.—AQUEOUS ROCKS.—IGNEOUS ROCKS.—GEOLOGICAL SYSTEMS.

The crust of the globe, so far as is known at present, consists of various kinds of rocks. In some places portions of hard rock have been ground small into sand; portions of softer rocks, mixed with organic remains, have assumed the form of soil: and very often different kinds of minerals and metals are met with. But all the different kinds of rocks, including all the different appearances under which they are found, may be grouped into two classes;—**stratified** and **unstratified** rocks. In the former class, the rocks consist of regular layers or *strata*, which sometimes, as in slates and flagstones, may be easily separated; in the other class, no marks of stratification appear. From carefully examining the nature of these two classes, geologists have concluded that rocks of the former class have been formed by the agency of water, and they, therefore, have termed them **aqueous** rocks: while those of the other class they suppose to have been formed by the action of fire, and they have, therefore, termed them **igneous** rocks.

In the stratified rocks, the remains of plants and animals are often found in a fossil state, that is, hardened into stone; and from a careful examination of these fossils, geologists have been enabled to classify the various aqueous rocks, and to determine which are of the oldest

formation and which the most recent. The fossils found embedded in the rocks prove that the rocks themselves were at one time in a soft and yielding state, like sand or mud: and as the rocks composing a single system are very often several thousand feet in thickness, and as it would require an immense number of years to harden the soft mud or sand into rocks, we must conclude that many thousands, perhaps millions, of years have elapsed between the formation of the earliest and most recent systems. We may also remark that the plants and animals found in a fossil state are quite distinct from any now in existence; and therefore it would appear that the world had been created, and had been clothed with plants and inhabited by animals, long before the creation of man.

We may perhaps think that the teaching of geology contradicts the Mosaic account of the creation. But as God is the Author, both of nature and revelation, we may be certain that if our deductions from science are correct, they will not militate against Scripture. At one time it was thought that the discoveries of astronomy were contradicted by Scripture, but this opinion is no longer held. Men are beginning to see that as the Bible reveals to us truths which it would have been impossible for man otherwise to have known, so science presents problems which man, by the proper use of his reason, *may* discover: thus science and revelation have distinct provinces which ought not to be confounded together. Judging, then, from the facts presented by discoveries in geology, the first and most common opinion was, that there have been successive creations, as indicated by the different fossil plants and animals found in different systems of rocks; and that as it was only in the last creation that man appeared, so the Mosaic account referred to that creation alone. For a time this opinion was very generally received, but subsequent discoveries in this science have shown that there is no evidence of *breaks* between different systems; and that, therefore, the idea of successive creations divided from each other by a chaos cannot be considered tenable. The

most probable theory is that set forth by the late Hugh Miller, in his *Testimony of the Rocks*, to the effect that there has been but one creation;—the one mentioned in Genesis; but that each day really means an immense duration of time. The chief difficulty in the adoption of this theory lies in the meaning of the word *day*; but it will occur to every one that in many parts of Scripture the word “day” means a larger portion of time than 24 hours.

We may suppose, then, that the world existed many thousands of years before the creation of man; but that during all these long periods it was being prepared for his abode, and when at last everything was in readiness then man was created. Each system of rocks represents, as it were, an epoch of time; and by carefully noticing the fossils of each system, along with the character of the rocks among which they are embedded, we may form some idea of the condition of the globe at the time these rocks were being formed. From a collection of the results thus carefully obtained, we find that originally the earth was in a fluid state, and had a much higher temperature than at present, and that from that period up to the creation of man, it went on cooling, and gradually became solid.

On examining the fossils of each system of rocks, we find that in the oldest formations animal and vegetable life was either altogether wanting, or only appeared in the lowest forms, but that gradually as the earth assumed its present temperature, and the distribution of land and water became as it is now, higher orders of plants and animals appeared. Sea-weeds, mosses, ferns, pines, tropical vegetation, and the trees and plants of temperate regions successively appeared; while in the animal kingdom, fishes, birds, and land-animals successively prepared the way for man. But it is in its relation to *Physical Geography* that we must at present treat of Geology, and its importance in this respect will be seen at once, when it is understood that upon the character of the rocks found in any district, not only the character of the minerals

associated with these rocks, but also the general configuration of surface, and the variety of scenery, depend.

We have hitherto spoken only of *aqueous* rocks; but as these must have been formed at the bottom of rivers, lakes, and seas, and as the effect of aqueous agency is always to wear down, had there been no other contrary agency at work, the surface of the globe would gradually have assumed a smooth and monotonous level. But from the earliest periods there has always been an upheaving energy at work, and this agency is yet seen in volcanic eruptions, earthquakes, and boiling springs. What this agency is, and what is the origin of the force we cannot tell: probably there is some centre of heat in the interior of the earth to which all volcanic upheavals and irruptions of the present and former periods owe their origin. The *effect* of this upheaving force, however, is seen in the varied surface of the globe; hill, dale, mountain, and precipice—nay, the very existence of dry land above the surface of the water may be ascribed to it.

It is agreed amongst geologists, as a settled truth, that all stratified rocks were originally deposited in a horizontal position, and that therefore, whenever they appear out of this position, it must be owing to volcanic agency, and we may be sure to find igneous rocks in the neighbourhood. These rocks were originally in a hot fluid state resembling lava, and this molten matter having been forced up from the interior of the earth, in some cases caused simply an upheaval; in others, high mountain masses were formed, and sometimes the igneous matter has burst out, and appears on the surface. And it will be seen that, just in proportion as this igneous agency has been more or less active, so the rocks will be more or less displaced, and the surface more or less varied.

These eruptions and upheavals have occurred at every period in the earth's history, and therefore we find igneous rocks more or less associated with every geological system; but, as a general rule, the upheaving force has been more active in the earlier systems than in the later

ones, and hence, as a general rule in those districts where the earlier systems of stratified rocks prevail—as in the Highlands of Scotland, for example—there we find the boldest and grandest scenery. In some cases the igneous matter coming in contact with stratified rocks has entirely changed their character: thus limestone has been crystallized into marble, and coal changed into coke.

As igneous rocks have been formed at different times, they differ in character and texture: but we may include them all in two great classes—**Granitic** and **Trappean**. Rocks of the former class—and granite may be taken as a specimen—occur generally in the earlier systems. The trappean rocks include *trap* and *basalt*. Trap derives its name from the Swedish word *trappa* a stair, and is so termed because of the terraced, or step-like, appearance of many hills where this rock is found. Basalt is a close-grained, dark-coloured rock, and often occurs in columns, more or less regular, of which fine examples may be seen in Fingal's Cave in the island of Staffa, and in the Giant's Causeway on the north coast of Ireland.

We shall now give a brief account of the different systems of stratified rocks, beginning with those of the oldest formation.

1. **Metamorphic System.**—The rocks belonging to this system are hard and crystalline, showing that they have been exposed to great heat. They are also destitute of fossils, and hence it is supposed that as yet neither animal nor vegetable life had any existence on the globe. Slate, marble, and granite are obtained from among the strata; and the ores of tin, copper, lead, silver, and gold are often found. The scenery in metamorphic districts is generally bold, rugged, and picturesque, but the soil is often sterile and unproductive.

2. **Silurian System.**—Among the rocks of this system we find roofing slate and flagstones, with ores of mercury, gold, and silver. The richest gold-fields in the world belong to this system. The fossils are all of a marine character, and consist chiefly of shell-fish; traces of mosses

and sea-weeds have also been found. The scenery is less bold than in metamorphic districts, but is perhaps more beautiful, being varied with hill, dale, ravine, and glen.

3. Old Red Sandstone, or Devonian System.—This system is composed chiefly of sandstone rocks, and they owe their reddish colour to the presence of iron in the water in which they were deposited. The distinctive fossils in this system are fishes of various forms, but all covered with hard enamelled scales, or bony plates. Among plants we find sea-weeds, rushes, and tree-ferns. Ripple-marks and impressions made by showers of rain are also occasionally found on the rocks. The minerals belonging to this system are not very important, consisting principally of flagstones and building stones. The scenery is often flat and tame, showing that igneous action has not been so great as in the two preceding systems; sometimes, however, “the hills of old red districts present great diversity of scenery; here rising in rounded heights, there sinking in easy undulations, now swelling into sunny slopes, and anon retiring in winding glens, or rounded valley-basins of great beauty and fertility.” The soil is generally well adapted for agriculture.

4. Carboniferous System.—This is one of the most important of all the geological systems. Its rocks consist of sandstones, clays, shales, and limestones; and its fossils give evidence of an extraordinary abundance of vegetation. It is to the gigantic pines, palms, tree-ferns, reeds, and club-mosses which flourished at this period that we owe our extensive coal-fields. These plants all indicate a moist and equable climate; and as the fossils are of a similar character wherever coal-beds are found, it would appear that at this period all parts of the globe enjoyed a similar climate. This circumstance may be in great measure explained by supposing a different distribution of land from what now exists. The minerals belonging to this system are very valuable, consisting of building-stone, limestone, marble, lead, and silver; but, above all, iron and coal. In some places, however, as in Ireland, the

mountain limestone belonging to this system may be largely developed, while the *coal-measures* are almost entirely wanting. The scenery, with the exception of some limestone districts, is generally tame and unpicturesque; and the soil is often cold and only moderately fertile.

5. Permian System.—The principal rocks belonging to this system are sandstones, and yellowish magnesian limestones. The fossils are similar to those of the last system, but are by no means so abundant. There are traces also of true land-animals allied to the frog and lizard families. The minerals consist of excellent building-stones, limestones, gypsum, and copper. The scenery is generally tame and flat, and the soil affords rich verdant pastures.

6. Triassic System.—The rocks of this system are very similar to those of the last, and indeed the two systems are sometimes classed together as the *New Red Sandstone*. But it has been found that, in the Permian, the fossils are akin to those of the coal-measures and mountain limestone, while in the Triassic the plants are allied to the succeeding system. On slabs of sandstone belonging to the Triassic system well-defined footprints have been discovered. Some of these belong to a kind of lizard; but others appear to be those of a gigantic bird allied to the ostrich. The minerals are similar to those of the Permian system, if we substitute rock-salt for copper; and, like the Permian also, the soil is better suited for pastures than for mixed husbandry.

7. Oolitic System.—This system is mainly composed of limestones, sandstones, grits, shales, and clays, which indicate coral-reefs, sandbanks, beeches, and mud brought down by rivers and deposited in shallow seas. The distinctive fossils are those of huge reptiles belonging to the lizard family. Besides these there are traces of marsupial animals allied to the opossum and kangaroo, and the remains of an insectivorous creature have been detected. In some places fossil plants are very abundant, including coniferae, allied to the yew and cypress, and abundance of leaves belonging to plants resembling the lily, pine-apple,

and aloe. The minerals are of considerable importance, including building, paving, and tilestones, marbles, alum, jet (a hard variety of coal), and fuller's earth. The scenery is, upon the whole, varied and pleasing, and the soil dry and fertile.

8. **Cretaceous System.**—This system is composed chiefly of sands, dark clays, and thick beds of chalk. The fossils are principally of marine origin, comprising sponges, corals, fishes, and reptiles; and there are remains of certain mammals supposed by Professor Owen to be those of monkeys. Fossil plants are comparatively rare. The minerals are chiefly chalk and flint, and occasionally fuller's earth, and an inferior kind of building-stone. The physical aspect of chalk districts is readily distinguished by the rounded outlines of the hills and valleys, as seen in the "Downs" of Kent and Sussex. These downs afford excellent sheep pasture.

9. **Tertiary System.**—About the beginning of the present century stratified rocks were divided into *Primary*, *Transition*, *Secondary*, and *Tertiary*. The *primary* rocks coincided with what are now called *metamorphic*, the *transition* answered to the *Silurian*, while the *secondary* embraced all the strata from the old red sandstone to the chalk. These terms have, in a great measure, given place to others of more accurate signification, though they are still occasionally met with. The tertiary division, indeed, even now retains its place, but it has been subdivided into four groups—the *eocene*, *miocene*, *pliocene*, and *pleistocene*, the last mentioned is also sometimes known as the "Drift." In their mineral composition these groups consist of clays, sands, marls, grits, and limestones. Leaving out for the present the "Drift," we may mention that among the fossil plants of the tertiary system, we meet for the first time with true exogenous trees, such as oaks, elms, and beeches; while among animals we have species of every existing order except man. It is during this period also that we first meet with traces of that geographical distribution of animals which now exists; thus the fossil animals

of South America are akin to its present sloths, ant-eaters, and armadilloes; while in Australia we meet with animals allied to its marsupials. Europe was at this time distinguished by its gigantic pachyderms, including elephants and rhinoceroses; and, judging from these and similar fossils, it has been concluded that the latitudes of England, France, and Central Europe enjoyed at this time a tropical climate.

The pleistocene group is almost destitute of fossils, and is remarkable for its water-worn blocks or *boulders*, which, with their smoothed and scratched surfaces, give evidence of the action of glaciers, icebergs, and arctic currents. "After the deposition of the lower tertiaries, it would seem that the latitude of Britain and the north of Europe underwent a vast revolution as to climate, and that some new arrangement of sea and land took place at the same period. At all events, the large mammalia of the earlier tertiaries disappeared, and the land was submerged to the extent of several thousand feet, for we now find water-worn boulders on the tops of our highest hills. A cold period ensued, and icebergs, laden with boulders and gravel from other regions, passed over the latitudes and dropped their boulders on our then submerged lands. How long this process continued, it is impossible to determine; but by-and-by a gradual elevation of the submerged lands took place, our hill tops and ranges appeared as islands, and our valleys as friths and straits. In process of time the land was elevated to its present level, another distribution of sea and land took place, and the glacial epoch passed away. A new flora and fauna suitable to those new conditions were then established in Europe, and these, with the exception of a few that have since become extinct, are the species which now adorn our forests and people our fields."—(*Page: Text-Book of Geology.*)

The minerals belonging to the tertiary system include building-stone, marbles of various qualities, pipe and potter's clay, gypsum, and amber. The scenery in England

is generally tame, but on the Continent the tertiary districts are often varied and picturesque. The soil is generally fertile.

CHAPTER VI.

POST-TERTIARY SYSTEM.—DISTRIBUTION OF LAND AND WATER.—FORM AND ELEVATION OF CONTINENTS.—DEPTH OF THE OCEAN.—ATLANTIC BASIN.

All the accumulations and deposits which have been formed since the close of the "Drift" are included by geologists under the term *Post-Tertiary*. These accumulations embrace peat-mosses, coral-reefs, sand-banks, gravel beaches, and alluvial deposits, and are more numerous and of greater extent than might at first be supposed. For the agencies which formed the various systems of stratified rocks are still at work,—rains, winds, and frosts still wear down the surface of the land; rivers carry down mud to form deltas and beaches, or to silt up seas and lakes; the ocean is constantly changing the outline of its shores, while the igneous agency, as seen in earthquakes, volcanoes, and boiling springs, is still exerting its upheaving force. The Hoang-ho, flowing through the alluvial plains of China, is said to carry down to the sea 2,000,000 cubic feet of solid mud every hour; the quantity carried down by the Mississippi is said to be still greater; and the Ganges is said to convey daily into the Bay of Bengal as much solid substance as is contained in the greatest pyramid of Egypt. We have said that the ocean is constantly changing the outline of its shores. There are numerous instances to prove this. The site of Ravenspur, once an important place in Yorkshire, where Henry Bolingbroke landed in 1399, and Edward IV. about seventy years afterwards, is now covered by the sea; and Hornsea, another place in the same neighbourhood, once six miles from the coast, now stands on the shore. On

the other hand, all along the eastern coast of Italy we have examples of the land gaining upon the sea. The town of Adria, once a flourishing port which gave its name to the Adriatic, is now at least fifteen miles inland.

But not only the form but the elevation of the land is constantly changing. There is evidence to show that the whole east coast of Scotland has been raised twenty feet above its former level since the time that the Romans occupied this island. But in South America we meet with a still more remarkable instance of elevation. In one single night (Nov. 19, 1822) the coast of Chili, for a distance of 100 miles, with the mighty chain of the Andes, including Aconcagua, the loftiest mountain in the New World, was raised from two to seven feet above its former level, the extent of country upheaved being estimated at 10,000 square miles. Some portions of the earth's crust, however, appear to be subsiding. A large tract in the South Pacific, extending from Low Archipelago to Marshall Archipelago, a distance of 4500 miles, and many leagues in breadth, is supposed to mark the site of a former continent, the summits of the submerged mountains forming the centres of lagoons and atolls. A similar area of subsidence is met with in the Indian Ocean, and also in the Coralline Sea, off the north-east coast of Australia; and it has been thought by some that the chain of islands stretching from New Zealand to New Guinea once formed the eastern and northern boundary of the Australian continent. But it is principally in these regions that the coral zoophyte is busy building its reefs, and thus counteracting in some measure the subsidence of the land. The South Pacific is studded with coral islands, but perhaps the barrier reef off the north-east coast of Australia is the grandest coral formation existing. It extends 100 miles along the coast, at a distance of from 20 to 30 miles from the shore, and its breadth varies from 200 yards to a mile.

All these changes are great in themselves, and should the agencies by which they are produced continue at

work during immense periods of time, the distribution of land and water would probably undergo changes as great as any which geology seems to indicate; but the interval which has elapsed since the creation of man is so short when compared with the vast periods which must have elapsed before his appearance on the earth, that, speaking generally, we may say that the present distribution of land and water is the same as it was when man was first placed upon the globe. Now, as it appears that long previous to his creation, the earth was in a state of preparation for him, we may be sure that the present distribution of the continents, and the general elevation of the surface of the land, are just such as are most suitable for making the earth man's abode; and therefore it will be well to notice one or two particulars regarding this distribution, as well as relating to the form and elevation of the continents.

About three-fourths of the surface of the globe is covered with water; and of the remaining fourth, three parts of the land lie north of the equator. If, however, we draw a great circle through the coast of Peru and the south of Asia, we divide the surface of the earth into two equal parts, one of which contains nearly all the land, and the other the greater portion of the water. And in connexion with this it is curious to note that London is nearly the centre of the terrestrial hemisphere, and New Zealand nearly the centre of the aqueous hemisphere.

Form and Elevation of Continents.—If now we compare the great masses of land among themselves, we shall find that the continents may be grouped into three pairs:—Asia and Australia, Europe and Africa, North and South America. We shall find also that the northern and southern continents have each certain characteristics, and that they present certain contrasts. The northern continents are all much indented; each terminates on the south with three peninsulas; and each has an archipelago of islands attached to it. Of course, in order to make this parallel

hold, we must suppose the continent of America severed across the isthmus of Panama, and Central America would thus form one of the peninsulas. The southern continents are all compact in form; they each terminate on the south in one point, near which extremity there is an island; and they each have a large bulge, or deep bend, on their western sides.

The forms of the land-masses, of course, determine the forms of the great oceans: and thus we find the Pacific Ocean is rather oval in form, but widens towards the south; the shape of the Indian Ocean is triangular, with the apex of the triangle split by the peninsula of Hindostan; while the Atlantic, as Humboldt remarked, is valley-like in shape,—the opposite shores seem, as it were, to correspond to each other.

If we now turn our attention to the elevation of continents we shall also find certain general principles at work. The six continents seem constructed on three different plans: there is a similarity of structure in Europe and Asia, in North and South America, and in Africa and Australia. In the first pair the chief mountain-ranges run east and west; in the second, north and south; in the third, the mountain-chains lie round the coast. Africa and Australia at one time seem to have contained large inland seas, the remains of which appear in the large shallow lakes of Central Africa, and in the swamps and marshes which are found in the interior of Australia. Turning now to the other four continents, we find that they all rise gradually from the shores of the sea towards the interior, to some point of highest elevation. This line of elevation is never in the centre, but nearer one side of the continent than the other; and from this result two slopes unequal in length and in inclination. In the Old World, the long slope is always towards the north; the short one to the south. In the New World, the long one is towards the east; the short one towards the west. In Europe and Asia the long chain of mountains which divides the two slopes extends, with but

slight interruptions, from the Atlantic to the Pacific, and is known under the various names, given to it in different parts, of Pyrenees, Alps, Balkans, Caucasus, Paropamisian Mountains, the Hindoo Koosh, and the Himalayas. In America the division is formed by the Andes and Rocky Mountains. Upon the average the long slope is five times the length of the short one.

Another point worthy of notice is, that the absolute height of mountains is found to increase with the elevation of the table-lands on which they stand. Thus the plains of Siberia at the foot of the Altai Mountains have an elevation of about 380 feet, while the Altai chain has an altitude of 11,000 feet: the base of the Kuenlun is about 5000 feet above the sea-level, while the chain itself attains the elevation of 20,000 feet. Still further south the plateau of Thibet reaches the altitude of 14,000 feet, and the Himalayas in some peaks reach 30,000 feet. Turning now to the New World we find the same law prevailing. The valley of Virginia in North America is about 300 feet above the level of the sea, while the Appalachian mountains attain 6000 feet. Farther west, at the foot of the Rocky Mountains, we find Fort St Vrain situated 5000 feet above sea-level, while the mountains themselves attain the height of 12,000 feet.

We have mentioned that in the Old World the slopes are north and south; in the New World, east and west; but in both Worlds the two laws exert their influence. Thus, in the great continent of Europe and Asia, though the main slopes are north and south, yet, commencing with the Himalaya Mountains, the elevation of the continent decreases to the east and west; and in the New World, besides the great slopes to the east and west, we find two secondary slopes to the north and south. We may sum up the foregoing remarks, on the elevation of the land-masses, in two important conclusions:—

1. Generally speaking the elevations go on increasing from the poles to the tropical regions. The greatest elevations, however, are not at the equator, but in the neigh-

bourhood of the tropics : near the tropic of Cancer, in the Old World (the Himalayas 27° north), and near the tropic of Capricorn, in the New World (Lirima 23° south).

2. All the long and gentle slopes descend to the Atlantic ; all the short and rapid slopes, to the Pacific and Indian Oceans.

Depth of the Oceans.—It was at one time supposed that the average depth of the ocean was equal to the average elevation of the land ; but this was a mere supposition. Great difficulties presented themselves at every attempt to fathom what sailors call "the blue water," and after several failures the results at length obtained were open to considerable doubt. Lieutenant Walsh, an American, reported a cast of 34,000 feet between the Bermudas and Azores, without finding a bottom. Off the mouth of the La Plata, Captain Denham reported a depth of 46,000 feet ; while Lieutenant Parker sounded with a line 50,000 feet, near the same region, without having reached the bottom. He was engaged in this experiment eight or nine hours, and night coming on, he attempted to haul in the sounding-line, when it broke. The usual method of sounding is this : a cannon ball weighing thirty-two or sixty-eight pounds is attached to the end of a sounding-line. This line is made of twine prepared for the purpose, carefully marked at every length of one hundred fathoms, and wound on reels of ten thousand fathoms each. The ball is dropped into the water and the line allowed to run out freely : and it was supposed that when the plummet reached the bottom, the line would cease to run out ; and then by breaking off the twine, and counting the number of fathoms left, the quantity given out could be calculated. But when lengths of forty or fifty thousand fathoms were given out without apparently having reached the bottom, it was suspected that the line must have been carried away by under-currents : and this suspicion was strengthened by the fact, that the twine parted the moment it was prevented running out by being made fast to the boat.

After considerable care and trouble, the *law of descent*

was established, and according to this law, the line on being dragged down by the ball, runs out at a decreasing rate. Thus :—

2' 21"	was the aver. time of descent from	400 to	500 fath.
3' 26"	"	"	1000 to 1100 "
4' 29"	"	"	1800 to 1900 "

Now, as under-currents would cause the line to run out at a uniform rate, it will be evident that by carefully noting the rate at which the line ran out, it might be ascertained when the ball had reached the bottom, for then the line would begin to run out regularly.

By attending to the law of descent it has been found that the depths mentioned above are much too great, and that the deepest part of the Atlantic is probably south of the Great Banks of Newfoundland, and there the depth does not exceed 25,000 feet. Now that deep-sea soundings may be made with some approach to accuracy, we may expect to see a new feature in physical geography, and no doubt in time we shall be as well acquainted with the elevations and depressions of the bed of the ocean as we are with the surface of the land. Lieutenant Maury has already constructed a map of the basin of the Atlantic, and similar maps will no doubt from time to time appear, as our knowledge of this subject is extended. The most interesting feature in the bed of the Atlantic is the telegraphic plateau. This is a ridge of land extending from Cape Clear, in Ireland, to Cape Race, in Newfoundland; the distance is about 1640 miles, and the depth is nowhere more than from ten to twelve thousand feet. It is along this ridge that the telegraph between Europe and America is laid; and although for the present this cable is useless, it is gratifying to learn from the highest authority that we may hope—due regard being paid to the construction of the cable and to the method of laying it down—yet to see telegraphic communication between the Old and New Worlds.

CHAPTER VII.

THE ATMOSPHERE—ITS USES.—WINDS.—EFFECT OF THE DISTRIBUTION OF LAND.—MONSOONS.—VARIABLE WINDS.

We have hitherto spoken only of two divisions of our globe, land and water; but there is a third division—the air—which is not less important than either, since without it, neither vegetable nor animal life could exist: it is also the medium for distributing the light and heat which we receive from the sun, and upon it depend every beauty of colour and every variety of sound. The air, or atmosphere, as it is called, entirely envelops our globe, and extends to a distance of from 50 to 100 miles from its surface. As it is subject to the law of gravitation, and is also a highly elastic fluid, the lower strata of air are pressed down by those above them, and hence are much denser: from this it follows also that the atmosphere exerts a certain pressure upon the surface of the earth, and this is found by experiment to be about 15 lbs. to a square inch. It has been calculated that the amount of the pressure of the atmosphere upon a man's body would be sufficient to break the back of a horse: but this force is counter-balanced by the air inside the body; for every vessel and tube is filled with it. Travellers, however, who have ascended very high mountains, such as the Alps, feel this balance destroyed, because the upper strata of air are much less dense than the lower, and hence bleeding often commences at the nose, eyes, and ears.

We derive our light and heat from the sun. When a ray of light strikes upon any body, part of it passes through it, part of it is reflected back, and part of it is lost and dispersed. This is the case upon whatever kind of body the light may strike; for though we call those bodies transparent through which light passes easily, yet a small portion of it passes through opaque bodies: and on the other hand, even in transparent bodies, all the

light is not transmitted,—part is reflected, and part dispersed and lost. When a ray of light passes obliquely from a rare into a denser medium, it is bent from its course, and this change in its direction is called **Refraction**. Now, as the atmosphere is a denser medium than void space, and as different portions of the air differ in density, it happens that the light proceeding from the sun, moon, or stars, is *refracted* in coming to us, unless these bodies are in the zenith; and, as objects always appear in the direction in which rays from them strike the eye, the effect of refraction is to make the heavenly bodies appear to have a greater altitude than they have really, and this must be taken into account by astronomers in all their observations.

When the light from the sun strikes upon our atmosphere, part of it is reflected back, and part of it is refracted and proceeds through the air; and as it advances into media more and more dense, other portions are reflected and refracted, and when it strikes the surface, part of it is again reflected back and absorbed. It is to this constant reflection from different particles of the atmosphere, and from material objects, that we owe the broad light of day. Were there no atmosphere, or did it not possess the property of reflecting and dispersing light, there would be no light, except directly in a line with the rays of the sun; all objects out of the direct influence of the rays would be wrapt in total darkness. Another important result of reflection is **Twilight**. When the sun is a little below the horizon, just before sunrise, or a little after sunset, his rays, shooting up into the atmosphere, are partially reflected back upon the earth, and afford a faint daylight.

The white light of the sun's rays is made up of three different colours—red, yellow, and blue, and these coloured rays are differently affected in passing through any medium. Some objects absorb one or more of these rays, and reflect the others, and upon the colour of the reflected light depends the colour of the object. Thus, all the dif-

ferent varieties of colour depend on the reflection of light. We have seen that when light strikes the surface of the earth a portion of it is reflected. Of this reflected light the red and yellow portions struggle back through the atmosphere, while the blue is again reflected back to the earth, and hence the blue appearance of the sky. Travellers, on ascending high mountains, find the sky get blacker and blacker: for as the air becomes more rare, there are fewer particles to reflect back the blue light.

The sun's rays convey to us heat as well as light; hence, as the rays are dispersed throughout the atmosphere, heat is diffused at the same time. Now, the more dense the air is, the greater will be the amount of heat which it will contain, and thus the tops of mountains are always cold, for there the air is much more rare than at the surface of the earth. This fact shows the importance of considering the elevation of surface in any particular case, for upon the elevation depends, in a great measure, the temperature. It has been calculated that an elevation of 350 feet makes a difference of one degree Fahrenheit, or, in other words, it is almost equal to a removal of one degree nearer to the poles.

We have already said that the atmosphere is the medium of sound: without it there would be a deathlike silence, for all sound depends upon the vibrations of the air. All fluids transmit sound, some even better than air, and there are some kinds of wood which convey the vibrations nearly seventeen times as rapidly as air; but still these media can only be available by actual contact, and therefore it is upon the atmosphere that we must depend for the sound, however produced; and without it the sweetest strains of music would be silent,—nay, conversation even would be impossible.

Such are some of the uses of the atmosphere, even in a quiescent state. It is necessary to the existence of life; it disperses light and heat; it is the cause of sound. When set in motion, we see it performing other offices equally important. Winds convey heat and moisture from one

part of the earth to another, and form a powerful agency for assisting man in mechanical skill and commercial enterprise.

Winds.—We have already stated that the atmosphere presses upon every part of the earth's surface with a weight of about 15 lbs. to a square inch; and that the lower strata of air, being pressed down by those above, are denser and heavier. Heat expands air and makes it lighter; it then ascends until it reaches a stratum of its own density. If, therefore, any portion of the atmosphere becomes heated, it rises, and leaves a vacuum; the surrounding air then rushes in to fill up the vacuum and produce equilibrium: a current of air is thus formed, and this current we call *wind*.

Were the earth entirely covered with water, and the atmosphere everywhere of the same temperature, there would be no wind. If, however, the tropical parts of the earth were heated, as they are now, the air in these regions would become rarefied and ascend, and we should have a current from each pole towards the equator. These **Polar currents**, however, would necessitate return currents to supply the vacuum caused at the poles, and these return currents, consisting of warm rarefied air, would be upper currents; while the cold currents from the poles would be surface currents.

The diurnal motion of the earth would alter the direction of these winds somewhat. The earth, in turning on its axis from west to east, carries the air along with it, and imparts its own motion to it. As was before mentioned (page 18), the equator is a great circle, and all circles drawn parallel to it must decrease in circumference as they approach the poles; therefore, in one diurnal revolution, any spot upon the equator must describe a greater circle than any other spot nearer the poles, and must therefore move with greater velocity. And since the earth imparts its motion to the surrounding atmosphere, the air at the equator must move from west to east with greater velocity than the air nearer the poles. If,

therefore, a current of air comes from the poles to the equator, as it approaches the tropics it will move from west to east more slowly than the earth does ; it is therefore left behind, and, as a consequence, *appears* to move in the opposite direction—that is, from east to west. Thus, instead of having winds directly from each pole to the equator, we have them blowing from the north-east and south-east ; and, when they have reached the tropics, their direction is almost entirely from east to west, and they are termed **Trade winds**. For the same reason the *return* winds to the poles blow from the south-west and north-west, instead of directly from the south and north.

The ascending current of warm air at the equator will rise, as has been said, until it meets with a stratum of its own density ; it then turns northwards or southwards as a return wind, and is gradually cooled. As it cools it becomes denser, and therefore heavier ; it then gradually descends, and, at about 30° on each side of the equator, touches the surface of the earth. We thus have a regular and complete circulation in the air : currents flow from either pole to the equator, then rise and flow back to the poles ; and the polar and return winds, as we have seen, cross at about 30° on each side of the equator. It has also been proved that the winds cross at the equator—that is, it is the current from the north pole which forms the return current to the south pole, and *vice versâ*. Near Cape Verde Islands, and in the Mediterranean, sailors have frequently met with showers of red dust. Portions of this dust were analyzed by Ehrenberg, an eminent German chemist, and from the organic remains discovered in it, he was convinced that this dust came originally from the basins of the Amazon and Orinoco, regions south of the zone of calms.

We have seen, then, that if the earth were entirely covered with water, and there were no land to break and change the direction of atmospheric currents, that, owing to the combined influences of the heat of the sun and the diurnal motion of the earth, we should have a constant

and regular circulation of air. North-east and south-east winds would move towards the equator, gradually assuming more of an easterly course as they approached the tropics; and **Return currents** of air would flow back towards the poles. We have seen also that the polar winds cross each other at the equator, and that the polar and return winds cross near the tropics. Hence we have three **Calm belts**, each extending right round the globe, except where broken and interrupted by local causes. The first is the belt of equatorial calms, where the north-east and south-east trade winds meet; for there the *ascending* currents neutralize the horizontal currents: and at about 30° on each side of the equatorial belt, are the belts of Cancer and Capricorn, where the return winds and polar winds meet.

We have next to consider how the winds are modified by the distribution of land. And, in the first place, we notice that the zone or belt of south-east trades is broader than the belt of north-east trades; and that the equatorial belt of calms does not in fact coincide with the equator, but lies a little to the north of it. This is owing to the preponderance of land in the northern hemisphere. For owing to this circumstance the *thermal* equator, or line of greatest heat, lies to the north of the terrestrial equator; and as the ascending current of warm air will always be at the line of greatest heat, we find the trade winds range themselves on each side of the *thermal* equator. Again, the large deserts of Africa and Asia act as a check upon the north-east trade wind; for the air over these barren tracts being extremely rarefied, especially during summer, a portion of the north-east trades is required to restore equilibrium. Evidence of this fact is seen in the character of the two trades. For the south-east trade wind is much stronger and "fresher" than the north-east, and hence is not so much influenced by the rotation of the earth. Thus, while the north-east trade winds, in their general course, make with the equator an angle of 23°, those of the south-east make an angle of 30° or even more.

Monsoons.—So great, indeed, is the influence of the arid plains and deserts of Africa upon the trade winds, that during the months of summer and autumn, the north-east trade is not only checked, but even turned back, and blows over the deserts of Africa; while the south-east trade, meeting with no opposition at the equator, crosses the line and, continuing northwards, is changed into a south-west wind, and forms a monsoon. For a similar reason periodical winds exist on the west coast of Mexico. But it is in the Indian Ocean where the monsoons are most perfectly developed. In summer, when the sun is north of the equator, the heated plains of Asia rarefy the air above them, and to restore equilibrium the south-east trade wind is turned back and formed into a south-west monsoon. Between October and April the sun is south of the equator, and hence there is a rush of air towards the south of Africa, and the north-east monsoon prevails. These winds blow with great regularity, and hence their name, which signifies *season*.

We have already remarked that the equatorial belt of calms or "Doldrums," as it is called, coincides with the line of greatest heat; now, as the sun moves northwards and southwards in the tropics, this line of greatest heat will not be stationary, but will follow the sun, and, as a consequence, we find that the "Doldrums" move northward from May to September, and southward between September and May. Of course, this movement affects the other belts of calm, and therefore the position on the earth's surface where the return winds begin to prevail as surface winds will vary with the seasons. These winds will approach nearer to the poles, before they reach the surface, in summer than in winter. This is an important fact, as will be seen when we come to speak of the distribution of rain.

In the north Atlantic, sailing packets from America to Europe have performed the voyage in from 20 to 23 days, while the same vessels, in a voyage from Europe to America, generally require from 35 to 40 days; the

difference being caused by the prevailing south-west winds. As these winds are warm and moist, while the north-east winds are cold and dry, we cannot but admire that beautiful dispensation of Providence which causes these winds to be the means of mitigating the rigour of our northern climate, and of fertilizing the land with copious showers. The constant struggle between the north-east and south-west winds is the cause of those frequent changes, in direction, of the winds so generally felt in temperate and polar regions; and hence these parts are known as the regions of *variable* winds, just as the torrid zone, where the trade winds and monsoons prevail, is called the region of *permanent* and *periodical* winds.

CHAPTER VIII.

RAINS.—THEORY OF RAINS.—DISTRIBUTION IN TROPICAL REGIONS—IN TEMPERATE REGIONS.—DEW.—SNOW.

Vapour is constantly rising from every portion of the surface of the earth, at all times and at all temperatures; and this vapour is absorbed by the atmosphere. When the vapour is condensed and made visible, it is called *rain* or *dew*, according to the manner of its deposition; or if the cold which condenses it be very great, *snow* is formed. Cold air can hold less vapour in solution than warm air. When, therefore, a portion of the atmosphere is saturated, that is, has as much moisture in solution as it can possibly contain, if it be then heated, its capacity for holding moisture is at once increased, and it is enabled to take up more: if, however, its temperature be diminished, its capacity is lessened, and the superabundant moisture is condensed, and becomes visible. Thus, if a warm current of air, laden with moisture, comes in contact with a colder current, rain is freely deposited; if, on the other hand, a cold current of air, laden with clouds, meets with a

warmer current, the clouds are sometimes dissipated, and the air cleared.

It thus appears that rains depend in a great measure upon winds; where the latter are regular so are the former; where winds are changeable, rains are irregular. Let us now apply these principles to the tropics. When the sun approaches the zenith of any place in this region, the ascending current of air becomes very strong, and carries large quantities of vapour up with it. As this current passes into colder strata of air, part of the moisture held in solution is condensed, and falls in heavy rains. And as the sun is *twice* over the zenith of every place within the tropics in the course of a year, it follows that there are two rainy seasons at these places, though the first is the most important, and lasts four months, while the second lasts only six weeks.

In districts where the monsoons prevail, these winds determine the rainy season. Hence the eastern and western coasts of Hindostan have rainy seasons at different parts of the year—one coast depending on the north-east monsoon, while the other depends on the monsoon from the south-west. Countries beyond the tropics depend generally upon the return winds for their moisture. Sub-tropical regions,—that is those regions immediately beyond the tropics,—are generally deficient in moisture. For they are not within the influence of the trade winds, and the return winds are scarcely felt. Thus we can explain the slight rains of Australia and the Cape; and partially account for the deserts of Africa and Arabia. On the other hand, the equatorial belt of calms is a zone of almost constant precipitation. There the ascending currents of air are constantly carrying up into colder strata quantities of moisture, part of which is at once condensed, and falls in the form of rain, and part is carried north and south by the return winds; hence the copious rains of Senegambia and Guinea.

As a rule, rain is much more abundant within the tropics than in temperate regions, for there the evapora-

tion is much greater, owing to the excessive heat. Upon an average 97 inches of rain fall annually within the tropics; while in temperate regions the annual fall is only about 35 inches. Owing to local causes, however, the quantity of rain that falls in some places far exceeds these figures. On the southern slope of the Khasia Mountains, in Bengal, 600 inches have fallen in one year; in Sierra Leone, 400 inches; and 300 inches have been noticed at Mahabaleshwar in the Western Ghats, a little south of Bombay. Even in temperate regions the annual quantity is often very great: Seathwaite, in the heart of the Cumberland Mountains, is perhaps the wettest place in Europe; the fall here is about 146 inches annually. It may be remarked, that as regards both tropical and temperate regions, the New World has a climate much more moist than the Old World.

The higher we ascend into the air the colder it becomes. Rain is formed, as we have seen, when a stream of warm air comes in contact with a colder one; for then the vapour held in solution by the warm air is condensed. Hence we can explain how it is that so much rain falls in mountainous districts,—in Seathwaite, for example. For, suppose a wind laden with moisture to strike against the side of a mountain, in order to pass this obstacle it must ascend; the current is thus forced into a colder stratum, and the moisture in it is condensed, and perhaps falls as rain. Of course, a good deal will depend upon the amount of moisture contained by the warmer current; if the air is almost saturated, then most likely rain will be formed; if, on the other hand, the air does not contain much moisture, the vapour will perhaps be condensed into mist or clouds without the formation of rain. Neither do clouds always deposit the whole of their moisture; it is the *excess* which is precipitated. From these remarks it will be evident that in order to understand the general distribution of rain, we must consider the irregularities of the earth's surface, its plains, plateaus, and mountain-chains. Commencing, therefore, with the tropics, where the rains

are most regular, we find the trade winds, laden with moisture, sweep across the Atlantic and strike upon the coasts of Brazil, Guiana, the West Indies, and Florida: all these coasts are well watered. The winds continue their course across Southern and Central America, and meeting with the Andes are still further drained of their moisture; but in Mexico the mountains are not high enough to extract moisture from the trades, and hence they pass over the country and scarcely deposit one drop. Continuing their course across the Pacific, the trade winds come in contact with the coast of China, the Eastern Archipelago, and the northern parts of Australia; and here again abundant rains are found.

In the Indian Ocean the monsoons prevail, and the two coasts of Hindostan have rainy seasons at opposite periods of the year. Along the eastern coast of Africa, a chain of mountains runs from the equator to the Cape, and this chain extracts the moisture from the north-east monsoon, and prevents it from carrying its abundance of rain into the central regions of Southern Africa. We have already mentioned that the Guinea coast is in the zone of calms, and this alone would account for the quantity of moisture it receives; but we must also recollect, that in certain periods of the year a monsoon prevails on this part of the western coast of Africa (p. 50), and this monsoon is the principal *rain wind* of this region.

On the western coast of America there are two rainless districts,—the plateau of Mexico, and the desert of Atacama. The former we have already noticed, the latter is also deserving of attention. Owing to the altitude of the mountains which bound the desert of Atacama on the east, the trade winds are deprived of every drop of their moisture before they pass across them; and the moisture which arises from the adjacent waters of the Pacific is carried *away* by the trade winds; hence Atacama is rainless. Further north the mountains decrease in altitude, and the winds are enabled to convey some of their moisture across them: further south the return wind prevails, and, coming

from the north-west, carries moisture to the coasts of Chili; here again, however, the Andes interpose themselves, and the north-west wind, being deprived of its moisture, is changed into the dry *Pampero*, which sweeps across the plains of Paraguay and the deserts of the Pampas. The plateau of Mexico, as has been already indicated, owes its drought to the character of its surface. The north-east trade wind has been deprived of a great portion of its moisture in passing the West India Islands, and a little more is deposited when the wind strikes upon the edge of the table land; but, in sweeping across the plateau, there are no mountains of sufficient elevation to extract the remaining moisture, and thus the wind passes without yielding one drop. This is the case more or less with all plateaus and elevated plains, and hence we can account for the arid character of the interiors of Spain and Arabia, the plateau of Iran, and the desert of Cobi, in Central Asia. The Sahara of Africa is closed on the east from trade winds and monsoons, and this, combined with its sub-tropical position and the nature of its soil, makes it a complete desert.

Temperate regions depend for their moisture upon *return* winds, hence the western coasts of continents receive more rain than the eastern coasts. British Columbia, on the north-west coast of America, like Great Britain itself, has copious and abundant rains, and owing to the same cause,—its position on the western side of a continent. It has been stated that the return winds first strike the surface about 30° on each side of the equator, at the calm belts of Cancer and Capricorn; and it has been mentioned, also, that these belts are not stationary, but vary somewhat, moving northward between May and September, and southward between September and May. Now, as we have already intimated, these return winds are the *rain winds* of temperate regions, and of course a great portion of the moisture will be deposited where these winds first strike the surface. As, therefore, the return winds strike the surface at different places in dif-

ferent seasons of the year, we can understand how at one place we have winter rains prevailing, at another spring and autumn rains, at another summer rains. Thus, at the Cape, and in Southern Australia, we have autumn and winter rains; in Central Europe there are summer rains; in Southern Europe autumn rains; while winter rains prevail on the north coast of Africa.

A few general remarks will finish this subject. The annual amount of rain in the north temperate zone is half as much again as in the south temperate zone. Now, although we can see how beneficial this is, seeing that three-fourths of the entire land lie in the northern hemisphere (p. 39), still we cannot at first sight explain the fact: for, of course, more evaporation must take place in the southern hemisphere, where there is so much more water, than in the northern. And, indeed, it is so; but all this moisture is transferred to the northern hemisphere; for we have already seen that it is the south-east trade wind which forms the return wind to the north, and this return wind we have also seen is the rain wind for the north temperate regions.

Within the tropics very little rain falls upon the ocean. This we can readily understand, since there are no obstacles in the ocean, like mountain-chains, to condense the moisture carried along by the trade winds, but we cannot but notice the beneficial results of this, since the land which has the most need of the rain gets the most of it.

Though more rain falls in the tropics than in temperate regions there are fewer rainy days. This, again, is a beneficial arrangement; for if in temperate regions there were such long droughts as there are within the tropics, everything would be dried up for want of moisture. The reason of this may be easily explained. It has been mentioned that the higher the temperature of the air is, the greater is its capacity for containing moisture (p. 51), hence the atmosphere in tropical countries contains much more moisture than in temperate regions; now as this

moisture is taken in by the leaves of plants along with the air, it follows that they can exist a longer time without rain than they could in temperate regions. It is owing to the excessive moisture contained in the air of warm countries that those copious dews are formed, which also supply the want of rain. In our climate there is actually less moisture in the air in the damp raw days of January than in the bright clear days of July; but in the former case the moisture is condensed by the cold, and becomes sensible.

Dew.—The formation of dew is analogous to, though not identical with, the formation of rain. During day-time the earth and the atmosphere are both heated by the rays of the sun, and the air becomes loaded with the vapour which rises from the ground. But after sunset the earth cools very rapidly, and condenses the air with which it is immediately in contact. The air thus cooled can no longer retain its abundance of moisture, and part of it is deposited in the form of dew. Hence, in hot countries, where the quantity of moisture contained in the air is very great, the amount of dew deposited is very heavy, and this dew is of service in the long droughts as we have already mentioned, and in some cases makes up for the total absence of rain. It may also be remarked, that as the leaves of plants and trees radiate heat quicker than stones and gravel, so the amount of dew deposited on the former is much greater than on the latter, and this is another of the many beautiful arrangements we meet with in studying the laws by which Nature is governed.

Snow.—When the cold which condenses the moisture contained in the atmosphere is very great, snow is formed instead of rain. Snow generally consists of minute crystals, varying in form according to the degree of cold; and the whiteness of snow is owing to the light reflected from the numerous faces of these minute crystals. As the formation of snow depends upon a very low temperature, it is not found within the tropics, except at a very great elevation. In the southern hemisphere, owing to

the preponderance of water, winters are not so severe as in the northern hemisphere, hence there, at the sea-level, snow is not found so near the equator as in the northern hemisphere. In the northern hemisphere the line which marks the southern limit of snow runs from Canton in China, along the north of India, through the Mediterranean to the Gulf of Mexico; in the southern hemisphere it does not approach nearer the equator than the south of Australia, the Cape Colony, and Patagonia. As it becomes colder the higher we ascend into the atmosphere, even within the tropics the tops of some mountains are covered with perpetual snow. Upon an average the line of perpetual snow has an elevation of about 16,000 feet within the tropics, and descends as we approach the poles. In the Alps and Pyrenees it is about 8000 feet; and at the island of Mageroe, in the north of Europe, it descends to 2000 feet. Snow is of great use in protecting the ground, which it covers, from severe frosts; it prevents the earth from radiating too quickly, and defends it from piercing winds. In Siberia the difference between the temperature of the ground beneath the snow and that of the air above it has sometimes amounted to 48° Fahrenheit.

CHAPTER IX.

OCEANIC CURRENTS.—THE EQUATORIAL CURRENT.—THE GULF STREAM.—THE PACIFIC GULF STREAM.—THE OPEN SEA IN THE ARCTIC OCEAN.—THE SALTS OF THE OCEAN.—TRADE ROUTES.

Currents in the ocean depend upon the same causes as currents in the air; hence, if we understand the theory of winds, we shall have no difficulty about oceanic currents. The waters within the tropics being greatly heated, evaporation, as we have already mentioned (p. 52), takes place to a considerable extent. To supply the vacuum

caused by evaporation, as well as to restore the equilibrium destroyed by the waters at the equator becoming heated, and therefore lighter, cold currents will flow in from the north and south. And thus, as with winds, we might expect a cold current from either pole, an equatorial current, and return currents to the poles. The normal character of these currents must also be considerably modified by the distribution of land, though to a much greater extent than in the case of winds.

Commencing with the Pacific Ocean, we find that in the great southern basin various cold currents flow from the Antarctic regions northward. One of these washes Van Diemen's Land and the south parts of Australia; another reaches Cape Horn, where it then splits, one branch flowing round the cape to the east, while the other proceeds up the western coast of South America, and at length mingles its waters with the great equatorial current. This current, which by some has been named after Humboldt, is much colder than the waters of the neighbouring ocean, and off Lima the difference in temperature is said to amount to 20° Fahrenheit. The **Equatorial current** sweeps across the Pacific with a speed ranging from 30 to 35 miles a-day, and extends in a broad belt on each side of the equator, with a breadth of about 50°.

On reaching the chain of islands which stretches between Asia and Australia, the equatorial current is broken up into several channels, and struggles through into the Indian Ocean. Here it is acted on by the monsoons, and its course checked; but a portion continues its course to the west, and striking the large island of Madagascar, splits: one branch rounds the northern extremity of the island and flows southward through the Mozambique Channel, the other flows south-west and joins the **Mozambique current** at the Cape. Off the Cape a large sandbank—the Agulhas bank—has been formed, stretching more than 500 miles from east to west, with an average breadth of 100 miles. Between this bank and

the mainland, the **Cape current** flows, and on entering the Atlantic it is met by another current which sets in from the north-west. It therefore divides : a part returns with the Atlantic current into the Indian Ocean, while the other part flows north-west along the western coast of Africa, and joins the great equatorial current of the Atlantic.

The equatorial current in this ocean flows from the Gulf of Guinea across to the continent of South America, which it reaches near Cape St Roque. Here, owing to the direction of the coast, it divides : one branch turns southward along the coast of Brazil, while the other washes the north coast of South America, and having passed the shores of Guiana enters the Caribbean Sea. A branch of the Brazil current turns south-west across the Atlantic, and, under the name of **South-connecting current**, enters the Indian Ocean, while another branch, as we have already seen, meets the Cape current on its entrance into the Atlantic. The Guiana current, after passing through the Caribbean Sea, follows the shores of the Gulf of Mexico, and emerges through the Strait of Florida under the name of the Gulf Stream.

The Gulf Stream.—This current can be easily distinguished from the waters of the surrounding ocean by its colour—a deep indigo,—its high temperature, and its speed. On leaving the Gulf of Mexico the stream is of no great breadth, but of considerable depth, as has been proved by soundings : there is little change of temperature even at the depth of 3000 feet. The warmer waters, however, being light, gradually ascend and spread themselves over the surface, so that off Cape Hatteras it spreads across the Atlantic and reaches the Azores. Here a large portion of the stream turns southward, and having bathed the shores of Portugal and Africa, mingles its waters with the great equatorial current in the Gulf of Guinea. The other division of the Gulf Stream proceeds to the north-east, washes the shores of the British Islands, and proceeds along the coast of Norway as far as the

latitude of North Cape. Here, meeting with a cold current from the Arctic Ocean, the stream divides; one branch rounds North Cape and loses itself in Varanger Fiord; the other continues its course to the north, bathes the west coast of Spitzbergen, and gradually mingles with the waters of the Arctic Ocean.

Besides the cold current already mentioned, there are at least two others in the North Atlantic, which flow southward to supply the place of the waters conveyed away by the Gulf Stream. One flows along the coast of Greenland, and the other comes down Davis Strait, washes the shores of Labrador and Newfoundland, and is felt as far south as New York. The waters of these currents being cold and heavy, gradually sink as they move southward, and exist as under-currents. Hence huge icebergs, carried along by these invisible currents, sometimes stray as far as the 40th parallel.

The Pacific Gulf Stream.—The waters of the Indian Ocean are hotter than those of the Gulf of Mexico, and therefore, as might be expected, many warm streams leave this ocean, while cold ones, principally from the south, enter it. One of the warm streams, in its direction and character, very much resembles the Gulf Stream of the Atlantic. It flows through the strait of Malacca, turns north-east between Borneo and the coast of China, and being joined by a part of the great equatorial current of the Pacific, flows northward along the east coast of Japan, and enters the sea of Kamtschatka. A branch of the current now passes through Behring Strait into the Arctic Ocean; but the greater portion of it sweeps past the Aleutian Islands, and down the west coast of North America. By the time this current has reached California, in its progress to the south, it has lost much of its warmth, and gives a refreshing coolness to the sea-breezes of that coast, in the summer time.

As Behring Strait is too shallow to admit of under-currents, there is no cold current through it corresponding to the current on the east coast of Greenland. But the

cold current which, flowing from Davis Strait, washes the east coast of North America, has its counterpart in a cold current from the Sea of Okhotsk, which washes the west side of the Japan Isles, and flows southward between the China or Gulf Stream of the Pacific and the eastern shores of Asia.

The Open Sea in the Arctic Ocean.—It is the custom of whalers to mark their harpoons with the date and name of their ship; and sometimes whales have been caught in the Pacific, near Behring Strait, with harpoons in them bearing the stamps of ships which were cruising, not long before, in Baffin's Bay. The question naturally arose, How have these whales crossed from the Atlantic to the Pacific? In some cases the short interval that had elapsed precluded the idea of the whales having passed round by Cape Horn; and even if time had not been wanting, it is well known that whales cannot exist in the warm waters of the tropics, and therefore could not possibly pass from the North to the South Atlantic. Neither could it be supposed that the whales had passed under the ice which closes up the Arctic regions, for they cannot exist so long under the ice as such a passage would require. The only supposition left was, that there must be water communication somewhere through the Arctic Sea, from one side to the other. What made this supposition the more probable was, that it was well known that there was a current flowing through Davis Strait into the Arctic Ocean, as well as one flowing southward; for navigators in these seas have observed large icebergs drifting northward against a strong surface current flowing in the contrary direction. Now, this current northward, as it comes from the south, must be warmer than the one coming out of the Arctic Ocean, and it was argued that there must be some place where the warm waters of this under-current would come to the surface; and wherever this place might be, the severity of the climate must, to some extent, be mitigated by these warm waters. Hence, when Lieutenant De Haven was sent out in command of

an American expedition to search for Sir John Franklin, he was instructed to look out, when he had proceeded up Wellington Channel, for an open sea to the north and westward. He looked, and saw in that direction a "water sky." Dr Kane was still more successful. He and his party, having crossed a barrier of ice 80 or 100 miles in breadth, came upon an open sea north of the parallel of 82°. As far as the eye could reach was a sheet of water, the waves of which dashed on the beach with the swell of an ocean. The tides ebbed and flowed in it. Though just before reaching this sea the thermometer was at -60° , yet the water itself had a temperature of 36° ; water-fowl were feeding, and seals sporting about. —[*Maury: Physical Geography.*]

The Salts of the Sea.—It is well known that the sea is salt; and although some parts of the ocean differ from others in saltiness, the difference is never great. The solid parts of sea water amount to nearly $3\frac{1}{2}$ per cent. of its weight, and therefore, taking the average depth of the ocean at two miles, we may calculate that its waters hold in solution about seven millions of cubic miles of salt; and all this solid matter is received into the interstices of the sea water without swelling the mass. We may be sure, from what we know of the harmony in nature, that the presence of salt in the ocean is for some wise purpose; and it suggests itself at once to every one, that in conjunction with the tides and currents of the ocean, salt helps to keep the waters fresh and free from corruption; but it appears that it also gives vigour to the currents themselves, and assists and regulates evaporation.

In speaking of the origin of oceanic currents, we assigned two causes—the vacuum caused by evaporation, and the difference in density between the warm waters of the tropics and the cold waters of extra-tropical regions (p. 59); the presence of salt is a third cause. Fresh water contracts in cooling until it reaches 40° , when it begins to expand, and continues to do so unto the freezing point. Salt water, on the contrary, only expands through

heat. When salt water is exposed to heat, it is mostly fresh water that is evaporated—the salts are left behind: hence the surface water descends, and other water rises to the surface. The water that has been evaporated is carried away by winds, and deposited in the form of rain in other regions. Now, as in tropical regions the evaporation is in excess of precipitation, and as in extra-tropical regions, as a rule, the contrary holds: through time, unless some compensating cause was at work, we should have the waters of the tropics containing a superabundance of salt, while the polar regions would have a superabundance of fresh water. But there is a compensating cause at work in the form of under-currents, an example of which we find in the one which flows through Davis Strait into the Arctic Ocean. And we can understand now, how that being a warm current was yet an under-current, for it was rendered heavy through the abundance of the salt it contained. It is to the salts of the sea, also, that we owe the under-currents from the Mediterranean into the Atlantic, and from the Red Sea into the Indian Ocean.

The presence of salt in the ocean also regulates evaporation. It has been proved by experiments that the saltier the water is, the slower is the process of evaporation. Hence, as the trade winds carry off the moisture evaporated, the evaporation goes on slower, and thus excess is prevented. If, however, this process were to continue, evaporation would eventually cease. This is, however, provided for; the water, as it becomes saltier, becomes heavier, and therefore sinks; other water less salt then rises to the surface, and evaporation proceeds.—[Maurry.]

Trade Routes.—The routes pursued by navigators in their voyages to different countries depend chiefly upon the winds and currents; a few of the principal of these routes we shall briefly notice. In going from Europe to America, ships generally avoid the Gulf Stream by sailing, beyond its northern limit, between the parallels of 40° and 50°. By this means, on nearing the American coast, they are

assisted by the current which flows from Newfoundland to New York. In returning from America, the Gulf Stream is of service, though sometimes it is again avoided, on account of the damage which vessels often sustain while in it. The westerly winds which prevail in this part of the Atlantic make the return voyage much shorter than the other. Vessels going to the West Indies, or to Central America, direct their course southward, in order to come as soon as possible into the region of the trade winds. They reach the Madeiras, and then, leaving the Canaries to the east, enter the tropics. If the ship is bound to the Greater Antilles, or to the Gulf of Mexico, it takes the passage between Guadeloupe and Antigua; if to the Caribbean Sea, its course is between Martinique and Trinidad. Vessels returning from the Caribbean Sea pass through the Mona Channel, between Hayti and Porto Rico; those from the Gulf, go through the Strait of Florida. In both cases advantage is taken of the Gulf Stream, and the passage lies north-west, the ships often touching at the Bermudas and the Azores.

Navigators, when bound for the Southern hemisphere generally steer their course, as before, southward to the tropics. Then, under the influence of the trade winds, they approach the shore of Brazil about the parallel of 10° south, after which the coast of South America may be navigated in any direction. If bound for the Cape or the Indian Ocean, ships generally steer for the rocky island of Trinidad (lat. $20^{\circ} 30'$, long. 29° W.), and, passing to the west of it, sail with a westerly wind and the South-connecting current to the southern point of Africa. In returning from the Cape, a navigator sails with the south-east trade wind to St Helena. Then, crossing the line at about 20° west, he steers for the Azores, and falls in the track from the West Indies to Europe. Ships coming from South American ports keep near the coast as far the equator, in order to take advantage of any periodical winds.

Vessels bound for India or China sometimes call at the

Cape, though it involves a great loss of time. Their course across the Indian Ocean depends greatly on the monsoons. During the south-west monsoon, a ship bound for China generally steers due east, between the parallels of 36° and 40° south, as far as the meridian of 80° east. Then turning, first north-east and then due north, passes the Strait of Sunda, and enters the China Sea through the channel of Banca. During the prevalence of the north-east monsoon, the best passage is directly east from the Cape to Australia, a little south of the other route; then, having passed either through Bass Strait or round by Tasmania, to sail north-east to the New Hebrides, and then round to China. There are several routes **from the Cape to India**. The most direct, during the south-west monsoon, is through the Mozambique Channel; some, however, to avoid the supposed dangers of this channel, go to the east of Madagascar. During the north-east monsoon, the course is directly east to about the meridian of 80° , and then almost due north. In returning **from China and India** to Europe, the object is to get as soon as possible into the region of the south-east trade wind, for about the parallels of 15° or 18° south this wind blows with great steadiness. During the north-east monsoon, vessels from the Malabar coast, the Persian Gulf, and other countries lying to the west, sometimes take the Mozambique Channel.

The navigation of the Pacific Ocean is not so difficult as that either of the Indian Ocean or the Atlantic. **From Australia** vessels can almost sail in a straight line to Cape Horn. **From South America to China** there are two main routes: 1. From Callao, Guayaquil, or some other port, westward to the Marquesas; then south of Gilbert Islands and east of the Pelews to the Philippines. If the south-west monsoon is prevailing, the course is through the Strait of S. Bernardino; if it be during the north-east monsoon, the vessel rounds the northern extremity of the Philippines. 2. Taking advantage of the trade wind, the vessel reaches the Sandwich group,

and then steers westward in 12° or 15° north latitude, where the trade wind is strong. In returning to America, vessels keep about 28° north latitude, so as to avoid the north-east trade, and have the return winds as far as California; or, if necessary, they cut across the trade wind. During the north-east monsoon, vessels sailing from China direct their course south-east until about the parallel of New Caledonia, when there is plain sailing across the ocean. The first part of this course is rather dangerous, owing to numerous islands and coral banks.

CHAPTER X.

CLIMATE. — ZONES OF TEMPERATURE. — CAUSES WHICH INFLUENCE CLIMATE. — ISOTHERMAL LINES. — GENERAL REMARKS.

Climate is a word better understood than defined; it includes not only temperature, but also everything which affects the weather; and thus the climate of any place may be warm or cold, dry or humid, equable or variable, mild or excessive. The main point, however, to be attended to in noticing climate is, of course, temperature; and this is generally given in the degrees of a *thermometer*. This very useful instrument, which has already been referred to in these chapters, consists, in its simplest form, of a glass tube of uniform bore, partially filled with mercury or quicksilver, containing a hollow bulb at one end, and sealed at the other. As mercury readily expands with heat, and contracts by cold, the column in the tube rises or falls with every change of temperature; and as the tube is carefully graduated, we are enabled to express the temperature of any place at any time, by mentioning the number of degrees to which the mercury has risen. There are two thermometers in general use—that of Fahrenheit, and the one called the *Centigrade* thermometer. In the former the temperature of boiling water is

given at 212° ; while the freezing point is fixed at 32° . This is the thermometer to which we shall refer in this work. In the Centigrade thermometer the boiling point is fixed at 100° ; and the freezing point at 0° , or *zero*. It will thus be seen that the value of a degree is not the same in both these instruments, though the degrees of one may be reduced to those of the other.

It has been already observed (p. 46) that we obtain all our heat from the sun, and that the atmosphere is the chief means of spreading out the heat, thus received, all over the earth. From the shape of our globe it happens that all parts of the earth cannot be equally heated by the sun's rays; the equatorial parts must have a higher temperature than the parts near the poles; and the inclination of the earth's axis (p. 16), to which we owe the seasons, does not destroy this diversity of temperature, but rather increases it. Old geographers were accustomed to represent the temperature of the earth, by dividing its surface into five zones. The part between the tropics of Cancer and Capricorn was called the **Torrid zone**, because there the influence of the sun was supposed to be greatest. The districts round either pole, that is, within the Arctic and Antarctic circles, were called **Frigid zones**; because there the sun was supposed to have the least influence; and the two divisions between the frigid zones and the tropics, on the north and south sides of the equator respectively, were called **Temperate zones**, because there it was supposed that the sun was neither very hot nor very cold.

But when climate was more studied and better understood, it was found that these zones gave but a very imperfect idea of the distribution of temperature over the earth. It is found that there are so many causes which modify the temperature of places, that latitude alone is far from giving a sure index to it. The hottest place on the globe is a district lying between the 15th and 30th parallels north, and stretching from the centre of the Desert of Sahara to the shores of the Persian Gulf. In the Sahara, the thermometer in the shade frequently rises

to 113°. The coldest place on the globe is in Siberia, along the middle and lower courses of the River Lena, where in January the temperature is 40° below zero. It is plain, therefore, that there are other causes affecting temperature besides position with respect to the equator, and some of these may be now briefly mentioned. In doing so, however, we shall include all those influences which affect *climate*, properly so called.

1. **Surface.**—It has been already mentioned (p. 46) that the higher we ascend into the air the colder it becomes, and that an elevation of 350 feet makes a difference in temperature of 1° Fahrenheit. Now, as this is about the same as would be felt by moving 1° nearer the pole, we can understand that in ascending some of these high mountain-chains which are within the tropics, we might, in passing from the hot plains at the base to the snow which constantly rests on the summit, pass through the same gradations in temperature as we would in travelling from the equator to the poles. Hence, Quito, situated almost upon the equator, enjoys a mild and temperate climate, since it is elevated more than 9000 feet above the sea-level. In India, again, Europeans find sanitary stations in the elevated regions of the Ghauts and Neilgherry hills; and by ascending the height of 1000 feet, they can find a temperate climate to recruit their health, which has been broken by living in the hot burning plains lying along the coast. But not only does the *elevation* of a surface influence the temperature, a great deal depends on the *character* of the surface. It is the temperature of the *atmosphere* which affects the thermometer, and the atmosphere is only partially heated by the *direct* rays of the sun; it derives most of its warmth from the heat reflected from the earth. Now, some surfaces reflect heat better than others; land radiates heat better than water; white surfaces reflect more than dark ones. This will help us to account for the great heat felt in the deserts of Africa and Arabia, and to understand how draining the land, and clearing away forests have mitigated the severity

of the climate in some districts. We may notice also how the colour of snow tends to increase the little heat there is felt in high latitudes.

2. Presence of Large Bodies of Water.—Water has a great capacity for heat, but does not radiate it so quickly as land. Hence water has not such a high temperature as land in summer, nor does it fall so low in winter. And those countries which, owing to a large extent of coast, are much influenced by water, partake of its equable character. Hence we may account for the mild climate of the British Islands compared with the extreme climates of countries removed from the sea. Thus, Penzance, in Cornwall, and Barnaul, at the foot of the Altai Mountains, in Siberia, are nearly upon the same parallel of latitude, and have both nearly the same temperature in summer,—that is, about 60° Fahrenheit. But while the difference between the mean temperature of summer and winter is only about 16° at Penzance, at Barnaul it is above 55°. In Canada the mean summer temperature is about 70°, while the temperature of winter varies from 20° above to 25° below zero; but even here the equalizing influence of large masses of water is felt, for in the districts round the great lakes the climate is more mild and equable than in other parts.

As evaporation is more abundant from the surface of water than from land, another consequence of the presence of masses of water is, that the climate of maritime countries is more humid than is that of countries further inland; and the moisture of the atmosphere is shown in the luxuriant verdure of such countries. For this reason Ireland claims its title of "emerald isle;" and if we turn to the other side of the globe, we shall find that New Zealand can boast of the same bright verdure and luxuriance of vegetation, owing to the same cause.

3. Currents of the Ocean.—Foremost among the currents which influence climate is the Gulf Stream, to which the whole of Western Europe owes the mildness of its winters. A warm current of similar character, we have seen, flows in the Pacific, and no doubt it is owing to

this current, as well as to the west winds, that British Columbia enjoys a climate similar to that of Britain itself. The open sea in Arctic regions, where we have water with a temperature of 36° , surrounded by districts where the thermometer is below zero (p. 62), is owing to an under-current which brings with it the heat of the tropics; and we can easily understand what an immense influence the comparatively warm waters of this open sea must have in mitigating the rigour of these frozen regions. But in other places there are cold currents. We have already noticed Humboldt's current; and its effect upon the coast of Chili and Peru is such as to cause the temperature there to be lower than on the eastern coast of South America, contrary to the general rule.

4. Winds.—Every one living in England must be aware of the great influence winds have upon climate. In the early days of spring the prevalence of east winds will continue the frosts of winter into the months of April and May, while, if the wind veers round to the west, the thermometer instantly rises, and the heat sometimes becomes oppressive. The reason of this has been already explained. The winds which prevail in temperate regions are generally either from the north-east or south-west; if the former, they bring the cold of high latitudes; if the latter, they convey with them the heat of the tropics: and hence, as has been already remarked, as a rule, the east coasts of continents are colder than the west coasts. But there is another reason why west winds should be warm winds; these winds, as we have seen before, are the rain winds of temperate regions, and whenever rain is deposited, a quantity of heat is given out which was before latent. Water requires a certain amount of heat to change it into vapour, and this heat becomes latent: when, however, the vapour is again condensed, the heat is given out. Thus the great amount of evaporation which is constantly taking place within the tropics tends to reduce the normal temperature of those regions; and the rains which fall in temperate and cold regions tend to raise the temperature

of those parts. We all must have remarked how close and sultry the air often feels after heavy rains: and, owing to this cause, the coast of Norway and the shores of British Columbia have a higher temperature than, from their position, we should have expected.

There are other causes, besides those we have enumerated, which affect climate, but these will be sufficient to show that the latitude of any place will be far from giving us the temperature. To show how the normal temperature of a place is changed by other causes, **Isothermal lines**, or lines of equal heat have been constructed. These lines are drawn through all places which have the same mean annual temperature; and the distribution of heat over the globe is thus at once made apparent. Thus, commencing with the tropics, we have two isotherms denoting a mean annual temperature of 80° . One commences in the Pacific, on the line, bends to the north as it approaches the continent of America, passes through Central America, and then, bending south, passes through Venezuela and Guiana, sweeps across the Atlantic, through the Guinea Coast, turns northward to the district of greatest heat, and is continued through the northern parts of Hindostan; and then, bending south through further India, again approaches the equator. The other isotherm begins in the Pacific, 15° south of the equator, rises as it approaches the shores of Ecuador and New Granada, makes a sudden bend to the south almost as far as Rio Janeiro, again turns northward, and strikes the coast of Africa a little south of the line, bends again to the south in crossing the continent, touches the northern extremity of Madagascar, crosses the Indian Ocean, and is continued through the isles of the Eastern Archipelago into the Pacific.

The isotherm of 60° , in the northern hemisphere, passes through the Mediterranean: in the southern hemisphere it crosses the continent of South America near the mouth of the La Plata, bends northward in the Atlantic, till within the tropics, then, turning south, passes through Cape Town, touches on the southern coast of Western Australia, runs

through Melbourne, and almost touches the northern extremity of New Zealand. Round the southern extremity of this group of islands runs the isotherm of 50° , which, in the northern hemisphere, passes through Vancouver's Island, then, turning southward, reaches New York. In crossing the Atlantic the line follows the course of the Gulf Stream, reaches the west coast of Ireland, passes through Dublin and London, turns southward on reaching the Continent, touches at Brussels and Vienna, and is continued through the Crimea into Asia. It crosses this continent in almost a straight line, inclining a little to the south, and enters the Pacific through the strait which divides the two Japanese islands, Yesso and Nippon.

But places may have the same mean annual temperature, and yet differ very much in the character of their climate. Take London and Vienna for example: the mean winter temperature of the former is 37° , its mean summer temperature 64° ; on the other hand, Vienna has a mean winter temperature of 27° , while in summer the mean temperature is 70° . It is very important that the extremes of heat and cold should be noticed; for while some plants, like the myrtle, cannot endure severe winters, others, like the vine, may live through a severe winter, but require a certain amount of summer heat to bring their fruit to perfection. Hence other lines, showing the mean summer and the mean winter temperatures of places, have been constructed; the former are called *Isotheres*, or isothermal curves; the latter, *Isocheimenes*, or isocheimal curves. As water does not part so rapidly with its heat as land does, it preserves a more equable temperature throughout the year, and hence countries situated near the sea have a more moist and equable climate than those further inland. According to the amount of variation in their annual temperatures, climates have been divided into three kinds:—

1. *Insular and tropical climate*, where the variation does not reach 30° .
2. *Continental climate*, with a variation of from 30° to 60° .
3. *Excessive climate*, with a variation of 60° or more.

Within the tropics the heat of the sun is so great that modifying causes have very little effect upon the temperature, and hence the difference in temperature between the hottest and coldest months is not so great as in higher latitudes; thus, in British Guiana, the difference between the hottest and coldest months is only $2^{\circ} 2'$ Fahrenheit.

Before concluding this chapter, it may be remarked that, upon the whole, the climate of the New World is warmer and more moist than that of the Old World; and that the northern hemisphere has a mean annual temperature about 4° above that of the southern hemisphere. This latter statement may require some explanation. Although the sun is actually three million miles nearer the earth in winter than in summer, yet the amount of heat received by the earth at both these periods is the same (p. 19). Therefore, as far as this cause is concerned, the southern hemisphere should have as high temperature as the northern, but no higher. Since, however, there is more water to the south of the equator than to the north of it (p. 39), and as water is not such a good radiator of heat as land is, we should expect that the southern summers would not be so hot as the northern ones, but that the winters would be milder. Such is the case to some extent, and hence it is found that the mean temperature of the whole globe goes on increasing from January to July. But the climate of the southern hemisphere is still further cooled by the prevalence of cold currents in the Southern Ocean (p. 59), and by the free passage given to icebergs coming from the Antarctic Ocean: when to this is added the fact that more rain falls in the northern hemisphere than in the southern, while there is less evaporation, and when we recollect that the temperature of a place is lowered by evaporation, but raised by precipitation (p. 71), we shall have no difficulty in understanding that the mean temperature of the northern hemisphere is a little above that of the southern hemisphere.

CHAPTER XI.

VEGETABLE ZONES. — DISTRIBUTION OF PLANTS AND ANIMALS. — ORIGIN OF EXISTING VEGETATION. — ACCLIMATISATION. — PLANTS OF COMMERCIAL IMPORTANCE.

Plants depend for their very existence upon heat and moisture, and hence their distribution depends on the variety of climates. And just as the globe has been divided into five zones of temperature (p. 68), so there are certain zones of vegetation, which, though not rigorously correct in all cases, yet are convenient for reference, and give a good general idea of the distribution of plants. These are as follow :—

1. The equatorial zone of Palms and Bananas, extending on both sides of the thermal equator to about 15°.

2. The tropical zone of tree Ferns and Figs, from 15° to the tropics.

3. The sub-tropical zone of Myrtles and Laurels, from the tropics to latitude 34°.

4. The warm temperate zone of Evergreen trees from latitude 34° to 45°.

5. The cold temperate zone of European trees from latitude 45° to 58°.

6. The sub-arctic zone of Pines, from latitude 58° to the polar circle.

7. The arctic zone of Rhododendrons, from the polar circle to latitude 72°.

8. The polar zone of Alpine plants, beyond latitude 72°.

As, in passing from the base of a mountain within the tropics to the regions of eternal snow, we pass through the various climates which exist on the surface between the equator and the poles, so we pass through the different vegetable zones. The laws, however, which relate both to the vertical and horizontal distribution of vegetables, are subject to certain local modifications: some plants

seem limited to certain districts, owing to causes with which we are not well acquainted. Hence the whole globe has been divided into twenty-five **Phyto-geographic regions**, or botanical centres; each of which is distinguished by the peculiar features of its vegetation. Thus, the shores of the Mediterranean form the region of the *Labiata* and *Caryophyllæ* (to which the pink, catchfly, and sandwort belong). This region is distinguished by the number of its aromatic plants and fragrant rock-roses: there is an abundance of evergreen trees, but an absence of verdant turf. In South America we have the region of *Cinchonæ* (medicinal barks). This region is confined to the range of the Andes between the parallels of 5° north and 20° south latitude, at an elevation of from 5500 to 9600 feet above the level of the sea.

In South Africa, between the tropic of Capricorn and the Cape, we have the region of *Mesembryanthema*, or *Fig Marigolds* and *Stapelias*. This district is marked by the presence of plants with thick fleshy leaves, but bright and beautiful flowers. Here are found aloes, geraniums, irises, but, above all, heaths; of these last there are about 400 species, all exceedingly beautiful. Turning now to Australia, we find the southern half of it marked as the region of the *Epacrides* and *Eucalypti*. Here the trees are all evergreen with grass-like and stunted foliage: here flourish the myrtle, the acacia, and gum-tree, with arborescent ferns and nettles of gigantic size. New Zealand forms another region, distinguished by its graceful ferns and valuable pines: the flax plant is also very abundant.

Animals depend in a great measure upon plants for food, and, like plants, are subject to certain conditions of climate. Hence, both are subjected to the same laws, to some extent, in their distribution over the surface of the globe. The development of animal and vegetable life increases in energy and variety from the poles to the equator: this law, however, is reversed with regard to marine animals, for they increase, at least those of higher organization, from the equator to the poles. It has been

noticed also, that animal life decreases as we recede from the coasts to the interior of continents: for, as the climate is here less humid, vegetation is less abundant, and, of course, is less able to support the numerous tribes of animals which inhabit the maritime districts. But it may here be remarked, that although in such cases animal life is less abundant, yet in the arid plains of the interior the *individual* forms of life are better developed, and of greater strength and beauty; as, for example, the lion, which inhabits the interior of Africa. Animals, also, are subject to the same law as plants, with regard to vertical distribution. Thus, it has been said that the Himalayas, which from their base to their summits exhibit a temperature varying from the heat of the equator to the cold of the poles, also present a succession of species similar to what a traveller would meet with in going from India to Kamtschatka.

It has been found that, while a moist and warm climate is most suitable to vegetable life, a dry and hot climate brings animal life to greatest perfection. Hence, if we compare the organic productions of the Old and New Worlds, we shall find that while the latter is distinguished for the luxuriance and leafiness of its vegetation, the former is remarkable for the beauty and strength of its animals. Thus, South America is the region of the palm trees, which are distinguished by their height and the abundance of their foliage; while Africa, with its stunted foliage, can support the rhinoceros, hippopotamus, and the giraffe—the last of which has not even a representative in America. There are two classes of animals, however, which, as they depend immediately for their existence upon vegetation and warmth, come to great perfection in the New World—insects and reptiles. Nothing is so beautiful as the bright sparkling insects of South America; and nowhere are lizards, crocodiles, and serpents larger and more numerous. On the other hand, it is in the Old World that spices—the nutmeg, the clove, and ginger—are brought to greatest perfection; for these, as well as

aromatic fruits in general, seem to require a dry, hot climate in order to have their juices and perfume perfectly elaborated.

The characteristic animals of any region, embracing all the species, terrestrial and aquatic, are called a **Fauna**, just as the plants of any district form its **Flora**; and as the whole globe has been mapped out into twenty-five botanical centres, so the Fauna has been divided into five zoological kingdoms, each of which has certain subdivisions.

1. The **European** kingdom is divided into the north, middle, and southern provinces. The southern limit of the northern province almost coincides with the 60th parallel; while the great range of mountains extending from the Atlantic to the Black Sea, divides the middle from the southern province. Europe is especially noted for its birds, in the number of the species of which it exceeds any part of the globe with the exception of tropical America.

2. The **Asiatic** kingdom. This is also divided into three provinces, the central one being bounded on the north by the Altai Mountains, and on the south by the Himalayas and Hindoo Koosh. This kingdom, but especially the tropical province, is distinguished by the number of its Carnivora. This order of animals increases in the number of its species from the poles to the equator; and if we compare the tropical provinces of America, Africa, and Asia, we find the numbers of species found in them to be 109, 130, and 166 respectively. The Asiatic kingdom includes a part of the Indian Archipelago; and so well is the boundary marked, that, while in the Moluccas and at Timor there is a great abundance of Carnivora, on New Guinea, which is separated only by a narrow arm of the sea, these animals are almost, if not altogether, wanting.

3. The **Oceanic** kingdom. This kingdom, which only forms one province, includes Australia, Van Diemen's Land, the islands stretching from New Guinea to New Zealand, and the small groups of Polynesia. This pro-

vince or kingdom is distinguished by the presence of Marsupial, or pouched animals, and by the absence of the three orders of quadrumana (monkeys), pachydermata (thick-skinned animals, like the elephant, rhinoceros, horse), and ruminating animals, such as the ox, deer, or sheep. The south-eastern districts of Australia contain the greatest number of Marsupials; while in Europe, Asia, and Africa, these animals in their native state are unknown.

4. The **African** kingdom includes Africa, with the peninsula of Arabia, and the islands of Madagascar, Bourbon, and Mauritius. This kingdom is marked by the abundance of its Pachyderms. More species of this order occur in Africa than in any other part of the globe, and a species of elephant and the double-horned rhinoceros are peculiar to it.

5. The **American** kingdom is divided into four provinces, namely, those of Arctic, Northern, Tropical, and Southern America. The arctic province includes British and Russian America; the northern includes the United States; the tropical province embraces Central America, the West Indies, and South America as far as the parallel of 40° south latitude; the remaining portion of the continent forms the fourth province. It has been already remarked that the New World is not so rich in large animals, neither as regards species nor individuals, as is the Old World; but some particular orders and families are abundantly represented. Thus, tropical America is exceedingly rich in birds, reptiles, monkeys, and insects; and the order of Edentata, or toothless animals, chiefly inhabits the countries of South America, where the number of species is almost three times as many as are found in Asia, Africa, and Australia put together.

Origin of Existing Vegetation.—We have remarked that some plants appear to be limited to certain regions owing to causes with which we are not well acquainted; perhaps some light may be thrown upon this subject by a reference to geology. It has been already stated (p. 30), that in the older systems of stratified rocks, vegetation

was either wholly wanting, or only appeared in its lowest forms; but that gradually as the earth assumed its present condition, both as regards the distribution of land, and also climate, the different orders of plants increased in number and perfection. Thus, during the period when the carboniferous strata were being formed, it would appear that two-thirds of the abundant vegetation which then clothed our globe was composed of arborescent ferns; while the greater portion of the remainder consisted of club-mosses and equisetaceæ, all families belonging to the inferior order of cryptogamous plants. Another characteristic of the flora of that period was its uniformity; the fossil plants found in the coal-fields of Europe are identical with those found in the coal-beds of the tropics. It may be interesting, then, to consider how this lower vegetation has gradually been displaced by the more perfect flora which now exists. It would be out of place here to give the various theories which have been advanced on this subject, but one or two conclusions, which are generally admitted, may be mentioned:—1. It is supposed that originally each species of plant had a particular centre from which it gradually spread all around. The fact of some plants appearing in widely different localities, might, at first thought, seem to overthrow this opinion; but when we consider the extensive areas over which similar plants seem to have spread at certain geological epochs, and then remember the great changes which we know to have taken place since—the submergence and emergence of land, and the changes in its distribution, if to this we add the agencies still at work in spreading seed—birds, currents of the ocean, winds—we shall have little difficulty in believing that all plants of the same species, however wide apart they now may be, are sprung from one single species, and one centre. 2. The species of plants which first appeared on our globe were not only of a low type, but also comparatively few in number, and many of these gradually died out owing to climatic changes; while other species seem to have been introduced, suited to the new

order of things. 3. It is not supposed that any new species has appeared since the creation of man, though several would appear to have become extinct. In this way, perhaps, we may account for "botanic centres," by supposing that plants which come to the greatest perfection in these regions, first appeared in those districts. Thus, South Africa may perhaps be the native habitat of the heath; South America, of the cinchona; China, of the tea-plant.

What has been said on the origin of existing vegetation will apply in a great measure to the animal kingdom. There is the same progression from lower to higher types during geological ages; the same uniformity in the earlier, and variety in the later systems. It is not until we come to the lower tertiaries that we have any evidence of a geographical distribution of animals; and at the present day we have zoological kingdoms just as we have phyto-geographic regions. We may thus account for the perfection which the tiger attains in India, the elephant in Africa, the llama in South America, and the kangaroo in Australia, either by supposing that these animals have died, or are dying out in other regions, or that those particular regions are the native habitat of these particular animals.

Acclimatisation of Plants and Animals.—Previous to the creation of man, changes in the distribution of plants and animals would depend on natural causes; after man's appearance, however, though these causes would be still at work, still greater changes would be brought about by his agency. Plants and animals, useful to him, would be brought from various parts, and carefully reared in places more convenient for him, and raised to conditions of greater perfection. Thus, he early became acquainted with the various kinds of grain useful as food; and the horse, ox, sheep, and dog were reduced to a domestic state. On the discovery of America, it was found that that continent was almost destitute of useful animals, and accordingly the domestic animals of Europe were intro-

duced along with the sugar-cane, the coffee and cotton plants, the spices, and the cereal grains. In return, America gave to the Old World the potato, the cocoa, the vanilla, the quinquina, and the tobacco-plant. More recently, the cinchona has been transplanted to the uplands of India, and the llama and alpaca have been introduced into the continent of Australia. Australia, indeed, owes as much as America itself to the plants and animals of other quarters of the globe; salmon have been introduced into its rivers, song-birds into its woods, and sheep into its extensive pastures. Nor should we forget, in this brief notice of the acclimatisation of plants and animals, the introduction of the *eland* into this country. This noble antelope is a native of South Africa; it stands fully six feet high at the shoulder, and its flesh resembles beef in colour, grain, and flavour. It will readily breed in England, and several are now found in the parks of the nobility.

Some plants are of so much commercial importance; that a separate and more detailed account of them would seem to be required.

Tea.—The tea-plant is an evergreen shrub, growing to the height of five or six feet. It is indigenous to China, Japan, and Upper Assam, but is cultivated also at Java, and to some extent in Hindostan and Brazil. There are two species, but both green and black tea may be made from the leaves of either species, collected at different periods of the year. The tea-plant is cultivated in almost every province in China, but most comes from the provinces of Fokien and Kiang-nan, the former furnishing black tea, and the latter, green. Paraguay tea, is a species of holly which grows in the forest regions of Paraguay, and from it is made the beverage *maté*, so celebrated in the Spanish colonies of South America.

Coffee.—The coffee-tree is a native of the Ethiopian highlands of Africa, whence it was introduced into Arabia in the fifteenth century. It has been introduced into both the East and West Indies, and is cultivated to a large extent in Brazil, British India, and in the island of Ceylon.

Sugar.—The sugar-cane will grow anywhere within the tropics, and beyond these limits it may be cultivated with advantage in any place where the mean temperature of the year is not less than 64°. The most important districts where it is grown are the West Indies, Guiana, Brazil; the Mauritius, Hindostan, the Philippine Islands, and Java.

Cotton.—This plant belongs to the Mallow tribe. It is a shrub, varying in height, with dark broad leaves and large yellow flowers. The fruit is a pod or capsule, which contains the seeds embedded in a white or yellowish woolly substance which forms the raw cotton. There are several species of this plant, but the best is that called "sea-island cotton," which comes from the low sandy islands lying along the coast between Charleston and Savannah in North America. Cotton will grow in almost all the countries within the torrid zone; but the greater portion at present produced comes from the United States of America. It grows also in China and India, and has been introduced into parts of Africa and Australia.

Flax and Hemp.—Flax is produced from linseed, and is a plant with a delicate stem, long leaves, and blue flowers. It is grown in the north of Ireland, and in Russia, Prussia, Holland, Belgium, and parts of France. The fibre worked up into the linen yarn comes from the stalks. The *Hemp* plant is something like a large nettle, and grows to the height of five or six feet or more. It is a summer crop in several European countries, and a winter crop in Egypt and India. Lincolnshire and Suffolk are the only counties of England in which it is cultivated.

CHAPTER XII.

THE DISTRIBUTION OF MAN.—GREAT VARIETIES OF THE HUMAN FAMILY.—SUBDIVISIONS OF THE CAUCASIAN TYPE.—CONCLUSION.

Man, by his superior physical organization, as well as by his mental endowments, is placed at the head of all other animals. Although he is, to some extent, subject to the influences of climate, yet he differs from inferior animals by being able to live in all localities, under all climates, and at all altitudes to which organic life extends. Thus, while the different provinces and kingdoms among animals, and the different botanical centres among plants, would lead us to believe that the various *Flora* and *Fauna* have been brought into existence in those regions where they flourish best, man, as he is confined to no particular locality, would seem to have had but one origin, and to have sprung but from one centre. And if, applying the same rule that is made use of in respect to other organized beings, we suppose *that* to be the cradle of mankind where man appears in the greatest perfection of form, we should inevitably be led to fix upon the regions of Armenia and the Caucasus as the centre whence man has spread, since it is in those regions that we find the purest types of manly and feminine beauty.

The deductions of reason would thus lead us to the same conclusions as the teaching of Holy Writ; and we may, therefore, have no hesitation in asserting that mankind, although now spread over every quarter of the globe, and exhibiting great varieties of colour and feature, yet sprang originally from one centre and from one pair. In the infancy of the human race, no doubt, external causes had a greater influence upon the physical constitution of man than they now have. Be that as it may, since the dawn of history there have always been certain varieties in the human family, differing from each other,

not only in colour and feature, but also in intellectual character. These varieties have by some been divided into five classes, but it is more usual to speak of three great types—the Caucasian, Mongolian, and Ethiopian; while two other classes, the Malay and the American, may be looked upon as sub-varieties, which have arisen out of a combination of the other three. And here we would remark, once for all, that both in this and the preceding chapter we are indebted for our facts mainly to *Johnston's Physical Atlas*.

Caucasian Type.—This race is distinguished by a well-proportioned figure: the length of the extended arms is equal to the whole height of the body. The head is round, the face oval, the eyes well set, the nose narrow, and sometimes arched slightly. The mouth is small, the hair abundant on the head and chin, but thin on other parts of the body. The skin is generally fair and ruddy, or of various shades of brown. The hair varies in colour from yellow to black; the eyes, from blue to black. This race possesses great intellectual ability, firm perseverance, and great muscular strength. The type is divided into two great branches—the *Indo-European*, which includes the Georgians, Persians, and Hindoos, with other nations of Asia, and the greater portion of the inhabitants of Europe; and the *Semetic*, or *Syro-Arabian*, including the Syrians, Arabs, and Modern Egyptians.

Mongolian Type.—In this type the head is heavy, though not large, the cheek-bones are prominent, the nose flat. The eyes are set wide apart, and elevated at the outer corners. The skin is of an olive hue, the hair coarse and lank, the beard scanty, and the ankles weak. This race possesses less activity and endurance than the Caucasian; and the intellect, being only moderately developed, exercises itself rather with details than with general principles: it, however, shows great shrewdness and great imitative power. This branch of the human family, of which the Chinese may be regarded as the type, is deficient in imagination, but skilful in domestic

arts. In moral character it is crafty and insincere, obstinate and jealous. The Mongolian type is spread over the north and east of Asia, and ranges from 75° north latitude to 50° south. The *Esquimaux* of North America also belong to this type.

Ethiopian or Negro Type.—This type is characterized by a retreating forehead, prominent and wide mouth, thick lips, flat nose, and woolly hair: the eyes and skin are both black. The back part of the head is strongly developed, showing the preponderance of the animal over the intellectual nature. The race is capable of enduring great bodily labour and fatigue, and in disposition is patient, affectionate, honest, and contented. The intellect is quick in perception, but without depth. The Ethiopian type is found in its purity in Central and Western Africa; the *Papuans*, who inhabit New Guinea and the adjacent islands, are a subdivision of it.

The Malay Race.—This race seems to have sprung from a mixture of the Mongolian and Caucasian types. The forehead is low, the face broad and flat, and the colour of the skin varies from a clear brown to a dark olive. The limbs are not powerfully formed, but they are capable of great activity. The moral character of this race is treacherous, ferocious, and implacable. The Malay race is found in the Malay Peninsula, in Java, Sumatra, Borneo, and Madagascar; and the aborigines of Australia, with their gaunt bodies, lean limbs, and crooked backs, are another variety of it.

The American Race.—This race embraces the aborigines of North and South America, and, like the Malay race, seems to be a variety of the Mongolian type. The cheek bones are high, the forehead rather low, the nose prominent, and the mouth large. The body is generally well proportioned, the skin of a red or copper colour, the eyes black, and the hair black and scanty. The habits of the American race are active and vigilant, yet incapable of long endurance; in disposition it is daring and cruel, but at the same time generous and hospitable. The

American Indian is of a cold and melancholy temperament, and shows an extraordinary insensibility to pain.

If we estimate the whole number of the human family at nine hundred millions, we may assign three hundred and fifty millions to the Caucasian race; four hundred and twenty to the Mongolian race, including the Indians of America; one hundred millions to the Ethiopian race; and to the Malay race, thirty millions.

Turning now again to the Caucasian type, to which the greater portion of the inhabitants of the British Empire belongs, and with which we are, therefore, most interested, we find, as was before remarked, that it is divided into two branches—the Indo-European and the Syro-Arabian. If we now confine our attention to that portion of the first branch which inhabits Europe, we find that it is again subdivided into three varieties, differing from each other in physical, intellectual, and moral characteristics. These varieties are the Celtic, the Teutonic, and the Slavonic.

Celtic Variety.—In this variety the skin is dark and sallow, the eyes brown or black, and the hair also black. Among intellectual and moral qualities it is distinguished for quickness of perception, power of concentration, love of equality, society, amusement, and glory; and there is always a tendency to superstition. Populations belonging to this variety are often noted for fine blandishing manners and great external politeness, which is unaccompanied by inward sympathy. They generally make bad seamen, and do not succeed as colonists.

Teutonic Variety.—The characteristics of this variety are great strength of muscle and height of stature; the skin is generally fair, the hair red or yellowish, the eyes blue, the cheeks ruddy, the forehead high and broad:—

“Deep-blooming, strong, and yellow-haired,
The blue-eyed Saxon came.”—*Thomson*.

In mental and moral character this variety is marked by slowness but accuracy of conception: the Teuton is not witty like the Celt, and is wanting in concentration; but he is deep and acute. He is fond of independence and

self-government, provident, cautious, reserved, haughty ; but hospitable and forgiving. The Teutonic variety make skilful seamen, possess great musical talents, are cleanly, and fond of spirituous liquors. It may be remarked, that owing to superior intellectual ability, the Teutonic variety has everywhere conquered the other races and varieties with which it has come in contact.

Slavonic Variety.—This variety is marked by a sallow complexion, in shade between the Celtic and Teutonic : the eyes are generally grey or brown, the hair coarse and lank, the cheek-bones prominent, the forehead low. The Slavonian is generally short and thickset in stature, but possesses great muscular strength, and is of a hardy constitution. He is distinguished for great mechanical skill and power of imitation, and is fond of music, songs, and poetry. When under subjection he is cunning, deceitful, and revengeful ; but when free, frank and open. He is tenacious of old manners and prejudices, and is remarkable for a love of country and a want of cleanliness.

The Celtic variety prevails generally in Central and Southern Europe, in France, Spain, Portugal, Italy, Greece, parts of Switzerland and Germany, and in Belgium ; and in all these countries, with the exception of Greece, the Roman-catholic religion prevails. The Teutonic variety is found in Northern Germany, Prussia, Holland, Denmark, Norway, and Sweden ; and these countries are all Protestant. The inhabitants of Russia, the eastern part of Austria, and the greater portion of the people of Turkey, belong to the Slavonic variety, and here the prevailing religion is that of the Greek Church. In Great Britain, the Teutonic race prevails, with an admixture of Celtic blood ; in Ireland, the Celtic element preponderates. The original inhabitants of the British Islands were Celtic, though with a greater admixture of the Teutonic variety than is commonly supposed : the Picts and Scots both seem to have had a Teutonic origin. When the Saxons invaded Britain in the fifth century, the Celtic inhabitants were driven back

into the mountainous parts—into the Highlands of Scotland, Wales, and Cornwall. Next came the Northmen and Danes, who established themselves in the islands round Scotland, and on the north-east coasts of England, Scotland, and Ireland. Lastly, there was the invasion of the Normans, who, after the battle of Hastings (1066), became for awhile the predominant race in these islands. We cannot conclude this part of our subject better than in words taken from a work to which we are already largely indebted:—

“It is evident that the English people are not an entirely or purely Teutonic race, but that the admixture of Celtic blood has been gradually swallowed up, not only in the midland counties of England, but even in the more western counties,—Wales, of course, especially the southern part of it, excepted,—so that we may fairly assert, that whilst the inhabitants of the eastern and northern counties are (with very slight local exceptions, perhaps) entirely Teutonic, the mass of the English people, and of the Lowlands and the eastern coasts of Scotland, is a cross-breed, with four-fifths, at least, of purely Teutonic blood. It has taken hundreds of years ere this intelligent, active, persevering, industrious race of Britain has come forth out of this process of mixture which was going on during the middle ages, and that fine race of human beings has been formed for which Britain is so justly famed. Every one who has seen the principal countries of Europe will unhesitatingly admit that no finer men can be found than in the middle and higher classes of Britain; whilst female beauty, at least in England, is found inherent in individuals of all classes of society.”—[*Johnston: Physical Atlas.*]

Date	Time	Location	Weather	Wind	Temp	Humidity	Remarks
1998	10/10	10/10	10/10	10/10	10/10	10/10	10/10
1998	10/11	10/11	10/11	10/11	10/11	10/11	10/11
1998	10/12	10/12	10/12	10/12	10/12	10/12	10/12
1998	10/13	10/13	10/13	10/13	10/13	10/13	10/13
1998	10/14	10/14	10/14	10/14	10/14	10/14	10/14
1998	10/15	10/15	10/15	10/15	10/15	10/15	10/15
1998	10/16	10/16	10/16	10/16	10/16	10/16	10/16
1998	10/17	10/17	10/17	10/17	10/17	10/17	10/17
1998	10/18	10/18	10/18	10/18	10/18	10/18	10/18
1998	10/19	10/19	10/19	10/19	10/19	10/19	10/19
1998	10/20	10/20	10/20	10/20	10/20	10/20	10/20
1998	10/21	10/21	10/21	10/21	10/21	10/21	10/21
1998	10/22	10/22	10/22	10/22	10/22	10/22	10/22
1998	10/23	10/23	10/23	10/23	10/23	10/23	10/23
1998	10/24	10/24	10/24	10/24	10/24	10/24	10/24
1998	10/25	10/25	10/25	10/25	10/25	10/25	10/25
1998	10/26	10/26	10/26	10/26	10/26	10/26	10/26
1998	10/27	10/27	10/27	10/27	10/27	10/27	10/27
1998	10/28	10/28	10/28	10/28	10/28	10/28	10/28
1998	10/29	10/29	10/29	10/29	10/29	10/29	10/29
1998	10/30	10/30	10/30	10/30	10/30	10/30	10/30

PART III.

PHYSICAL POLITICAL,

AND

COMMERCIAL GEOGRAPHY

OF THE

BRITISH COLONIES.

PHYSICAL, POLITICAL, AND COMMERCIAL GEOGRAPHY OF THE BRITISH ISLANDS.

CHAPTER I.

GREAT BRITAIN—ITS SURFACE—GEOLOGY AND MINERALS.—THE NORTHERN DISTRICT.—MIDDLE DISTRICT.—SOUTHERN DISTRICT.—PENNINE DISTRICT.—CENTRAL DISTRICT.—CHALK DISTRICT.—DEVONIAN DISTRICT.—CAMBRIAN DISTRICT.

THE British Isles include Great Britain and Ireland with the adjacent islands. The island of Great Britain lies between the parallels of $49^{\circ} 58'$ and $58^{\circ} 41'$ north; and between $1^{\circ} 46'$ east longitude and $6^{\circ} 13'$ west. Its greatest length, from north to south, is about 608 miles, and the greatest breadth, from St David's head in Pembrokeshire to the Naze in Essex, is 280 miles. The breadth of the island, however, varies considerably; between the Friths of Forth and Clyde it is only 33 miles, and farther north the distance is still less. The total area of Great Britain, including islands, is about 88,000 square miles. Of these England and Wales occupy about 58,000 square miles, and Scotland, with its numerous islands, 30,000 square miles.

In giving a description of the surface and minerals of Great Britain, it appears most natural to begin at the

north, and we shall therefore commence with Scotland. We have already shown the intimate connexion which exists between the geography and geology of a country, and it may be as well, in dividing Great Britain into portions for the purpose of more accurate description, to have regard to its geological conformation. A line drawn from Stonehaven, through Crieff, to the mouth of the Clyde, and another from Dunbar to Girvan, in Ayrshire, would divide Scotland into three parts. These divisions may be respectively designated the *northern*, *middle*, and *southern* districts. In like manner the surface of England may be divided into five parts. The first, including that part of England which lies to the north of the 53d parallel, we shall call the *Pennine* district; the second, to the south of the Pennine district, bounded on the west by the 3d meridian of west longitude, and on the east by the chalk ranges running from the Wash to Lyme Regis, we shall call the *Central* district; the third, lying to the east of the last, we may term the *Chalk* district; while the remaining portions of Great Britain may be termed respectively the *Devonian* and *Cambrian* districts.

The Northern District.—This district, which lies north and west of a line drawn from Stonehaven to the mouth of the Clyde, is divided into two parts by the great vale of *Glenmore*. Lochs Lochie, Oich, and Ness are united together by the Caledonian Canal, and there is thus water communication between the Moray Frith and Loch Linnhe. The land on either side of Glenmore rises with a rapid ascent. On the western shores of Loch Ness is the mountain of *Mealfourvouny*, 2730 feet in height. North of Glenmore the country forms a dreary table-land, with an average elevation of 1000 feet. Huge mountain-masses rise up in all parts; but the main axis seems to run from north to south, and in this axis we have **Ben Derag** and **Ben Attow**, with elevations of 3500 and 4000 feet respectively. To the east of this main axis, and near the shores of Cromarty Frith, rises **Ben Wyvis**, 3400 feet in height.

South of Glenmore we have the great chain of the

Grampians. This range, commencing on the north-east coast of Kincardine, runs westward to the south-west extremity of the county of Aberdeen. Here it is joined by another chain from the north-east, and the two ranges unite in a remarkable knot of mountains called the **Cairngorm** group. The group consists of several mountains, the highest of which, **Ben Macdhui**, rises 4300 feet above the sea-level. The main chain now stretches south-west, throwing off branches on either side which spread over the counties of Perth and Inverness, and terminates on the west coast of Argyleshire. The **Monadh Leadh** mountains, to the west of Strathspey, run parallel with the Grampians, and may be said to belong to the same system. Towards the western extremity of the Grampians, near the shores of Loch Linnhe, is **Ben Nevis**, 4400 feet in height. This is the highest mountain in the British Isles. South of Ben Nevis rises **Ben Cruachan**, to the north-eastward of which extends a dreary and sterile district, known as the **Moor of Rannoch**. This dismal tract covers an area of about 400 square miles, and is destitute of trees, shrubs, and even heath, except on the shores of Loch Lydoch, where a few fir trees are found. To the south and east of the main chain of the Grampians are various summits which attain elevations between 3000 and 4000 feet. Amongst them may be mentioned **Schehallion**, **Ben More**, **Ben Ledi**, and **Ben Lomond**. Thus, we see that the surface of the greater portion of this region is mountainous and barren; round the east coast, however, level tracts occur at intervals, the two chief being known as the plains of *Caithness* and *Cromarty*. The plain of Caithness, at the extreme north-east, occupies about four-fifths of the county of that name; the plain of Cromarty lies on both sides of Cromarty Frith, and extends across to Dornoch Frith on the one hand, and Moray Frith on the other.

In turning to the geological character of this district, we may mention that Great Britain contains representatives of every system of stratified rocks. And, speaking

generally, if we commence at the northern extremity of the island, and travel south-east, we shall, in going from Cape Wrath to the mouth of the Thames, have passed in order from the most ancient to the most recent systems. The prevailing rocks in the district we are now considering belong to the Metamorphic system. Along the whole line which we indicated as the southern boundary of this region is found a narrow slip of the Silurian system, and a patch of the same is found on the west coast to the north of the island of Skye. Portions of the Old Red Sandstone are found on the north-east coast, extending from Dunnet Head southward, round the shores of Moray Frith. Igneous rocks—granite and trap—appear in various places, and the Cairngorm group supplies the granite which is exported in such quantities from Aberdeen. This district is not rich in minerals, and, besides granite, roofing slates, which are found in Argyleshire, are the chief mineral productions.

The Middle District.—This region is less elevated than the general surface of Scotland, and the mountains have no great height. There are three ranges of hills which, running in a similar direction, divide this, like the *Northern District*, into two parts. The **Campsie Hills** run in a north-east direction from Dumbarton, on the Clyde, to Stirling, on the Forth. On the other side of the river the **Ochills** commence, and, running in the same direction, overspread the peninsula of Fife; while the **Sidlaw Hills**, in Forfarshire, have the same direction to the north-east. Between the Ochill and Sidlaw Hills and the line drawn from Stonehaven to the Clyde lies the plain of *Strathmore*. This plain extends from north-east to south-west for a distance of 80 miles, with a breadth varying from 16 miles in its widest part to scarcely a mile at its northern extremity. The soil is well adapted for agriculture, and grain and potatoes are produced in abundance. The *Carse of Gowrie*, along the northern shore of the estuary of the Tay, may be looked upon as a branch from Strathmore. South of the Ochill and Campsie Hills

we have the plain of the *Clyde and Forth*. This plain has an elevation of about 200 feet above the sea-level, and includes some rich agricultural districts, especially the Lothians, Clydesdale, and the plain of Ayrshire. Immediately to the south of the Frith of Forth are the **Pentland Hills**, which properly belong to this region. They run from the neighbourhood of Edinburgh in a south-west direction, and are connected with the high ground which separates the upper courses of the Tweed and Clyde. The highest of the Pentland Hills is 1860 feet above the sea-level: **Arthur's Seat**, in the vicinity of Edinburgh, is 822 feet high.

Perhaps we shall have the clearest idea of the geological formation of this region if we consider it entirely composed of Old Red Sandstone overlaid in the central parts with carboniferous rocks. Thus, the whole plain of Strathmore, with the Carse of Gowrie, belongs to the Old Red Sandstone, and this system appears at intervals from Ayrshire to Dunbar; while the plain of the Clyde and Forth, together with the peninsula of Fife, forms the great coal district of Scotland. Outbursts of trap are very frequent, and it is owing to this that the *Middle District* has its varied and undulating character. This region is rich in minerals. *Coal* and *Iron*, the two most useful, are found in abundance, and building stone is plentiful.

The Southern District.—This includes the southern part of Scotland, and though not equal to the northern region in boldness and grandeur of scenery, it is nevertheless of a truly mountainous character. The **Cheviot Hills**, on the borders of England, commence near the second degree of west longitude, and run towards the south-west for some distance: they are then continued westward under the name of **Lowther** or **Lead Hills**, and at **Hart Fell** are joined by a range from the north-east. The main chain then continues in a zig-zag direction to the south-west, and terminates on the shores of the North Channel near Loch Ryan. The range which runs northward from Hart Fell is connected with the **Muirfoot** and **Lammer-**

muir Hills, which terminate on the east coast at St Abb's Head. Several summits in the Cheviot and Lowther Hills range between 2000 and 3000 feet in height. Among these may be mentioned **Queensberry Hill**, **Lowther Hill**, and **Black Larg**. The hill called **Cheviot** lies on the English side of the border, and is a round-topped summit, with an elevation of 2668 feet. **Cairnsmuir** in the west, and **Criffel** in the east of Kirkcudbrightshire, are respectively 2600 and 1830 feet high. We have already remarked that this region is essentially mountainous; we may now add that the various river-basins or dales are mere depressions in the surface, and bear a very small proportion to the elevated mass. Perhaps the only real *plains* in this district are the narrow slip along the northern shore of the Solway Frith and the lower basin of the Tweed.

At least three-fourths of this district belong to the Silurian system. A narrow band of Old Red Sandstone runs southward from St Abb's Head to the Cheviots, and the lower course of the Tweed runs through a carboniferous district: the rest is Silurian. In the Lowther Hills are valuable *lead* mines; *coal* is found in the neighbourhood of Berwick; and in Kirkcudbrightshire are some outbursts of *granite*.

Pennine District.—Through the centre of this district, from north to south, runs the **Pennine Chain**. From the Cheviot Hills, where it commences, to its termination in the Peak of Derbyshire, the distance is about 170 miles. The average width of the chain is about 40 miles; and there are numerous offshoots on each side, especially in the counties of Northumberland, Durham, and Lancashire. The culminating point in this chain is **Cross Fell** (2927), on the borders of Durham and Cumberland; and in Yorkshire the summits of **Whernside**, **Ingleborough**, and **Pen-y-gent** exceed 2000 feet. The **Cumbrian** group, though connected with the Pennine chain, is of different geological formation, and is characterized by summits of greater elevation, and scenery of a more romantic character.

Scaw Fell, the highest mountain in the group, attains an elevation of 3229 feet; **Helvellyn**, next in height, reaches 3055 feet; **Skiddaw**, 3022 feet. On the eastern side of the Pennine chain are two detached mountain systems—the **North York Moors** and the **Wolds**. The moors are in the north-east of Yorkshire, and form a high barren tract, the culminating point—**Bolton Head**—being 1489 feet high. The Yorkshire Wolds are in the south of the county, and are separated by the estuary of the Humber from the **Wolds of Lincolnshire**.

The position of the mountain-ranges determines the extent and character of the plains. In the eastern part of the Pennine district we have the great *York plain* extending from the coast of Northumberland southward to the Trent, and increasing in width as it advances to the south. In Northumberland and Durham its width is contracted by the offshoots from the Pennine chain, and in Yorkshire and Lincolnshire its eastern boundary is formed by the Moors and Wolds. Between the North York Moors and the Wolds is the *Vale of Pickering*, and between the Wolds and the sea is the level district called *Holderness*. This level tract is continued south of the Humber, and finally joins the marshy lands round the Wash. On the west side of the Pennine range is the beautiful *Vale of the Eden*. This vale is surrounded by the Pennine chain, the Cumbrian group, and Solway Frith; and Carlisle stands in its centre. South of the Lancashire moorlands is another plain, which extends across the Mersey, and includes part of Cheshire; it is generally known as the *Cheshire Plain*.

The geological character of this district is very varied. The rocks of the Carboniferous system, which appear in the lower part of the basin of the Tweed, are continued in the Pennine chain, and to a considerable distance on each side of it, as far south as Derby: and hence we have five important coal-fields—those of Durham and Northumberland, Whitehaven, Leeds and Nottingham, South Lancashire, and North Stafford. All these coal-fields are fringed

with a border of rocks belonging to the Permian system. The Cumbrian group belongs to the Silurian system; the North York Moors to the Oolitic; the Wolds are of chalk. The Vale of the Eden, the Cheshire, and the Yorkshire Plains belong to the Triassic system. Between the Wolds and the sea, and also on the coast of Lancashire, the Tertiary formation appears. From this variety in the geological character of this district we should expect an abundance of minerals; and such is the case. We have already noticed the five important coal-fields; in all these, but especially in those of Durham and Yorkshire, *iron* is abundant; *lead* is found in Northumberland, Cumberland, and Derbyshire. About one-fourth of the entire quantity of lead raised in England is supplied from the mines of Alston Moor, on the borders of Northumberland and Durham. The *plumbago* or black-lead found in the neighbourhood of Keswick, in Cumberland, is the best in the world. *Zinc* is found in Derbyshire; *salt*, in Cheshire; and *alum*, in the Oolitic district of Yorkshire. The Permian system supplies good building stone; the Carboniferous, mountain-limestone; and the Silurian, slates.

The Central District.—This district is triangular in shape, the three sides being the 53d parallel, the 3d meridian west longitude, and a line from Lynn to Lyme Regis. Like the central division of Scotland, its surface is not elevated, but varied. It consists essentially of an extensive plain, with an average elevation of from 200 to 400 feet, and numerous detached ranges of mountains of no great height. In this district the principal rivers of England take their rise; and therefore it may be convenient to subdivide the central district into four parts, corresponding to four large river-basins, or rather parts of river-basins. A line from the **Peckforton Hills**, in Cheshire, south-east to the **Cleat** and **Lickey Hills**, and then north-east to the Wash, will separate the basin of the Trent from those of the Severn and Wash Rivers. Another, drawn from a point on the line already indicated, near the source of the Warwickshire Avon, south-west to the **Cotswold**

Hills, and then directly south, will cut off the basin of the Severn; while another, from a point on the line last mentioned, near the source of the Nen, south-east to the **Chilterns**, will separate the upper part of the Thames from the basin of the Wash.

In the basin of the Severn, on the west, we find **Wenlock Edge**, the **Clee Hills**, the **Malvern Hills**, and a hilly district called **Dean Forest**: on the east, the **Wrekin**,—a detached summit 1320 feet high—the **Clent Hills**, the **Cotswold Hills**, and the **Mendip Hills**. The **Clee Hills** rise to 1805 feet; the **Malverns** reach 1444 feet; the other ranges average 1000 feet in elevation. **Edge Hill**, near the source of the Great Ouse, is 826 feet high. We have already mentioned that in form the Central district resembles a triangle; looking at it thus, we find that near two of its angles there are extensive marshes—*Brent Marsh*, and the *Fens* round the Wash. A great part of these marshes has been drained, but large tracts of waste land still remain.

A line drawn from Nottingham, through Warwick and Bath, to Lyme Regis, will divide the Central District into two parts, differing very much from each other in geological character. To the east of this line the Oolitic system prevails; to the west there is a great variety of systems, including Silurian, Old Red Sandstone, Carboniferous, Permian, and Triassic systems; the former division is destitute of any important minerals, while the latter is rich in its variety and abundance. The Oolitic system, which commences in the North York Moors, is narrowed to a mere strip as we trace it southwards; but on entering the Central District it expands to a considerable width, and continues south-west until it reaches the shores of the English Channel. The Triassic system, which we mentioned as appearing in the Cheshire plain, spreads out across the country as far as Nottingham, and, narrowing as it proceeds southwards, terminates in a point near Gloucester. To the west of the Severn the Old Red Sandstone forms a patch of similar form, but in this case the apex of

the triangle is towards the north. The Carboniferous system appears in detached coal-fields, of which we may enumerate six. Three of these, Leicester, Warwick, and South Stafford coal-fields, are enclosed in the Triassic district already mentioned, and three more are in the basin of the Severn—those of Colebrook Dale, Dean Forest, and Bristol; and all these, except the first and last mentioned, are fringed with rocks of the Permian system. The Silurian system is not largely represented in the Central district, and only appears to the west of the Severn, in the neighbourhood of Wenlock Edge and the Clee Hills.

In the western division of the Central district the minerals are rich in variety and abundance. *Coal* has been already noticed; *iron-ore* is very abundant in Staffordshire and in the Shropshire coal-fields; *copper* is found in Staffordshire; and *salt* at Droitwich, in Worcestershire. Good building stone is found in all parts of the district, and we may especially mention the Portland stone, found at Portland Isle, in Dorsetshire.

The Chalk District.—This division includes that part of England which lies east of a line drawn from Lynn to Lyme Regis. The different ranges of mountains are of chalk, and attain no great elevation. **Inkpen Beacon**, in Berkshire, is 1011 feet, and this is the only height in the chalk ranges that exceeds 1000 feet. *Salisbury Plain*, a district in Wiltshire, about fifty miles long by fifteen miles broad, is the point to which all the chalk ranges converge. From this plain a range runs north-east as far as the Thames, and is continued beyond that river under the names of Chiltern Hills and **East Anglian Heights**. This ridge nowhere rises much above 800 feet—the **Gog Magog Hills**, in Cambridgeshire, are only about 300 feet—and it terminates on the coast of Norfolk at Hunstanton Cliff. South of the Thames two ranges run off to the east—the **North Downs**, passing through Hampshire, Surrey, and Kent, terminate in the chalk cliffs of Dover; the **South Downs**, passing through the south of Hampshire and Sussex, appear on the shores of the English

Channel, between Brighton and Beachy Head. A fourth range turns south-west from Salisbury, and is known under the name of **Dorset Heights**. This range, after reaching Beaminster, curves round to the east, and, continuing through Purbeck Isle, terminates in St Alban's Head. The district between the North and South Downs is called the *Weald*, from an old Saxon word signifying a forest. This district was formerly a hunting ground, well stocked with wild swine and deer; but the greater portion of it is now under cultivation, though there are still extensive woodlands. In the south-east is an extensive level tract called *Romney Marsh*, which is protected from the sea by lofty embankments. In summer there is an abundance of pasturage for sheep and cattle; but the district is very unhealthy.

The district we are now considering belongs to the most recent geological systems. The chalk ranges, of course, belong to the Cretaceous system; the Weald belongs to a division of the Oolitic; and all the rest is of Tertiary formation. The minerals are of no great importance, consisting principally of *chalk*, *flint*, and different kinds of *clays*.

The Devonian District.—This embraces that part of the island which is west of the third meridian and south of the Bristol Channel. It may be subdivided into three parts—the first bounded on the west by the River Exe, and the second by the River Tamar. In the first division we have two small ranges of mountains—the **Quantock Hills** and the **Blackdown Hills**; and two beautiful vales—those of Taunton and Exeter. In the second division we have two high moorlands—**Exmoor** and **Dartmoor**. Exmoor forms an extensive sheep pasture; it has some considerable peat-swamps, and is almost destitute of trees. The highest point is **Dunkerry Beacon**, 1668 feet above the sea-level. Dartmoor is a plateau of larger extent and greater elevation, and is more rugged and barren in character. **Cawsand Beacon**, near its northern extremity, is 1792 feet in height. West of the Tamar a ridge of

considerable elevation runs through the entire length of Cornwall, and is known under the designation of the **Cornish Heights**; the culminating point in this ridge is **Brown Willy**, which is 1364 feet in height.

The Devonian District, considering its extent, has great variety in its geological character. Old Red Sandstone and Carboniferous are the prevailing systems, but the portion east of the Exe is principally Triassic. Outbursts of granite and trap are very frequent. Dartmoor is almost one mass of granite, and it appears also at various places in Cornwall. The abundance of minerals found corresponds to this variety in geological structure. *Tin* is peculiar to the counties of Devon and Cornwall; *copper* also and *lead* are very abundant. *Granite* is extensively quarried, and some beautiful *marble* is found near Tor Bay.

The Cambrian District.—This includes the principality of Wales, and is essentially a mountainous district. Though there is no well-defined range, yet we may trace one, with more or less distinctness, throughout the country from north to south. Beginning at the north, we have the **Snowdon range**, which runs north-east and south-west through the county of Caernarvon. The highest peak here, and indeed the highest summit in Great Britain, south of the Forth, is Snowdon itself, which has an elevation of 3590 feet.

From Snowdon a range may be traced round to the south-east, until we come to **Arran Fowddy**. Here a cross chain, known as the **Berwyn range**, parallel to the Snowdon range, runs from Llangollen, on the River Dee, to the shores of Cardigan Bay: **Cader Idris**, near the coast, belongs to this range. The district between the Snowdon and Berwyn ranges is exceedingly mountainous in character, but possesses beautiful and romantic vales, among which the *Vale of the Clwyd* deserves especial mention. Following now the direction of what we consider the main chain, we next come to **Plynlimmon**, a high mountain-mass, the summit of which, however, is

only 2481 feet high. Here a range runs across the country towards the banks of the Severn. This part of Wales has not such a mountainous character as the district further north: the mountains have smooth rounded tops, which are covered with short green sward. To the south of the Plynlimmon range, however, lies a dreary waste, consisting of barren hills and extensive morasses. This sterile tract is bounded on the south by the **Epynt Hills**, which are clothed with good pasturage. The *Vale of the Usk* separates the Epynt Hills from the **Black Forest range**; the highest summit of this range, called the **Beacon of Brecknock**, is 2862 feet above the level of the sea. To the south of the Black Forest are the **Mountains of Glamorgan**, which, though not high, are steep and rugged. Between the range last mentioned and the sea, stretches the vale or *Plain of Glamorgan*. This plain, with the level tract round Caermarthen Bay, forms the largest extent of level land in Wales.

The prevailing geological system in the Cambrian district is the Silurian: part of the Old Red Sandstone found in the valley of the Severn belongs also to this district, and there are three coal-fields—those of Flint, Anglesey, and South Wales. The last coal-field is very large, and produces also great quantities of iron. *Copper* and *lead* are found in North Wales, and *limestone* and *slates* are abundant and of good quality.

The total quantity of coal raised in Great Britain is probably not far short of 100,000,000 tons annually; and of this quantity the Durham and Northumberland coal-field supplies about one-fifth. About 4,000,000 tons of pig-iron are annually produced in England and Scotland, and of this the South Wales coal-field supplies about one-third; while next in importance rank the Staffordshire, and Edinburgh and Glasgow coal-fields.

CHAPTER II.

THE RIVERS OF GREAT BRITAIN.—PRINCIPAL RIVERS OF SCOTLAND—THE SPEY—DEE—TAY—FORTH—TWEED CLYDE.—LAKES OF SCOTLAND.

In speaking of the drainage of Great Britain, it may be remarked that the term *basin* is applied to any portion of the earth's surface, more or less extensive, which is drained by a river and its tributaries; and that the line, which separates the feeders of one basin from those of another, is called a *watershed*. A river-basin is not necessarily a hollow surface as the name would seem to indicate, but is sometimes—as that of the Tweed for example—a mountainous region, intersected by numerous valleys, through which the main stream and its various tributaries flow. Neither is the watershed in all cases a ridge of high land: in some instances the feeders rise at no great elevation, and in their course towards the main stream, cross those hill ranges which at first sight seem to form the watershed. Indeed it has been remarked that the Chalk ranges (p. 102) seldom form lines of watershed, the rivers for the most part making their way through them.

In Scotland and England the drainage is, in some measure, different. In Scotland the two main watersheds, those formed by the Grampians and Lowther hills respectively, run from north-east to south-west; while in England the principal line runs from north to south. In both countries the longest rivers flow eastward into the German Ocean: the Severn and the Clyde are the two great exceptions.

In the extreme north of Scotland there are no rivers of any importance, as, owing to the small breadth of the country, there is no space for large rivers to be developed. In the Grampians, however, several important rivers have their sources, among which may be mentioned the Findhorn, Spey, Doveran, Don, Dee, North and South Esk,

Tay, and Forth. In the Lowthers, and their continuations east and west, the Tweed, Clyde, Ayr, and Doon flow from the northern slope, and on the south side are the Dee, Nith, Annan, and Esk, which empty themselves into the Solway Frith. We shall now give a brief description of the principal of these rivers, commencing at the north, and proceeding southward.

The Spey.—This river takes its rise in *Loch Spey*, a small lake about six miles to the east of *Loch Lochy*, and elevated 1200 feet above the sea-level. For the first twelve miles the river runs due east, through a narrow glen; it then turns to the north-east, and preserves this direction to its mouth. After leaving the glen the Spey runs through a wide valley, thickly covered with timber, forming part of the forests of Abernethy and Kingussie. Its course here is rather slow, and it expands into *Loch Inch*, which is about three miles long and a mile broad. On issuing from this lake the current of the river increases in speed, and the valley through which it flows is narrowed by the approach of mountains on either side; on the east are the stupendous masses of Cairngorm, on the west are the Monadh Leadh mountains.

The first feeder of any importance, received by the Spey, is the **Dulnain**. This stream rises in the Monadh Leadh mountains, and flows at first through a narrow uninhabited glen. It then enters a valley clothed with thick woods, with here and there some patches of good pasture land: lower down there are tracts of cultivated land on either bank, and, after a course of about twenty-five miles, the Dulnain joins the main stream.

The Spey now flows on with decreasing rapidity, and the mountains on the west give place to undulating plains; but on the east they continue unto the junction of the **Avon**. This is the largest feeder of the Spey, and rises in *Loch Avon*, which is situated in the centre of the group of Cairngorm. The lake has an elevation of 1750 feet above the sea; and it is so overshadowed by Ben Macdhui and the adjacent mountains, that, for several winter

months, sunshine never reaches it. Not a shrub will grow on its banks, and there is not a living creature to break its solemn stillness. The Avon issues from this lake in a clear stream, and flows for some distance through a dark glen, first to the north-east, and then directly to the north. The valley through which it flows gradually widens; but in no part of its course are there any extensive flats, and high mountains continue to bound it on both sides, until it joins the Spey. Its total length is about forty miles.

After receiving the Avon the Spey continues to flow towards the north, and increases very much in rapidity. This is owing to the falls and rapids which occur in this part of its course. About seven miles above the mouth of the Avon, there is a fall of 30 feet; and, in the last three miles of its course, the river has a descent of sixty feet. The total length of the Spey is about 96 miles, and the area of its basin about 1300 miles. Being fed entirely by mountain streams, it varies very much in the quantity of its water, and is subject to great floods. This, together with its falls and rapids, renders it unfit for navigation, and it is chiefly used for sending down large floats of timber. Its salmon fisheries are important and valuable.

The Dee rises in the bosom of the Cairngorm mountains at an elevation of 4060 feet, and has a higher source than any other river in the British islands. Its course is at first southward through a deep and narrow glen; it then turns north-east, and flows through a valley thickly planted with forests of fir trees. About the middle of its course there is a long narrow pass between steep and lofty mountains, after which the valley widens, and affords several tracts suitable for agriculture. Throughout nearly the whole of its course, the Dee flows at the northern base of the Grampians. Owing to the height at which it rises, its course is very rapid, and its waters are remarkable for their clearness and purity. The salmon fisheries are very important. Its total length is about 87 miles, and it drains an area of 700 square miles.

The Tay.—This is the largest river in Scotland, and rises in the southern Grampians, a few miles to the north-west of Loch Lomond. It flows at first in a north-easterly direction, and expands into the beautiful *Loch Tay*. This lake is about sixteen miles long, and has an average breadth of about a mile. The river, on issuing from the loch, for the first time takes the name of Tay, and, being joined by the **Lyon**, flows through a rich, well-cultivated valley called Strath Tay, and is next augmented by the waters of the Tummel.

The Tummel rises in the Moor of Rannoch (p. 95), and drains the three lakes *Lydoch*, *Rannoch*, and *Ericht*; it also brings with it the waters of the *Garry*. Near the junction of the Garry and Tummel is the celebrated *Pass of Killiecrankie*—a narrow glen about half a mile long. At the northern extremity of this pass, Mackay was defeated by Dundee, who died in the moment of victory (1689).

After receiving the Tummel, the Tay flows southward, and the open valley gradually narrows into a glen, which terminates about two miles south of Dunkeld, with the *Pass of Birnam*. This glen exhibits some of the richest and most picturesque scenery in Scotland. The character of the scenery, however, now changes: hitherto the river has flowed through a Metamorphic district (p. 96), it now enters the district of the Old Red Sandstone, and the remainder of its course is through a country, fertile and well-cultivated, forming a part of the plain of Strathmore (p. 96). Soon after entering Strathmore, the Tay receives on its left bank the **Isla**. This tributary brings with it the waters of the **Sheo** and **Ardle**, which, when united, form the **Erroch**. After receiving the combined waters of the Isla and Erroch, the Tay makes a long sweep, and then expands into a large estuary, having been increased by its right-bank feeders, the Almond and Earn. The **Almond** rises to the south of Loch Tay, and before entering Strathmore, its course is through a wild and desolate valley. The **Earn** drains the lake of the same name. The scenery in the upper part of its course is grand and

picturesque, but below Crieff it flows through gently undulating plains, and enters the Frith of Tay, after a course of upwards of 50 miles.

The total length of the Tay is about 110 miles, and in volume of water it is said to exceed the Thames. It is the finest salmon river in Great Britain; the fish is mostly packed in ice and sent to London. The area of its basin is about 2400 square miles.

The Forth has its source in several mountain streams which rise on the skirts of Ben Lomond. Its general direction is to the south-east, and a little above Stirling it is joined by the Teith. This tributary has two sources, one about five, and the other about seven miles to the north of the source of the Forth. The southern branch drains *Loch Katrine*, and flows through the beautiful scenery of the Trosachs. This district "extending at the foot, and on the broken and often precipitous slopes of Ben Venue, exhibits, both by land and water, so many turnings and windings, so many heights and hollows, so many glens, capes, and bays, that it is impossible to advance twenty yards without having the prospect changed by the continual appearance of new objects, while others are constantly retiring out of sight."—(*Geography of England and Wales by Long and Porter.*)

After traversing *Lochs Achray* and *Vennacher* the stream is joined, a little above Callander, by the northern branch of the Teith, and then, having entered the fertile and undulating Strathmore, flows into the Forth. Between the junction of the Teith and Stirling, the Forth is joined by the *Allan*, which rises on the north-western declivity of the Ochill hills. Below Stirling the main stream receives the *Barnock*, rendered memorable by the victory of Bruce (1314). This small stream rises in the Campsie hills, and has a course to the eastward of about ten miles.

The *Devon* rises in the heart of the Ochill hills, and receives the greatest part of the waters of that region. Its course is at first from west to east, then making a sudden bend to the south and west, it breaks through a

deep and rocky chasm which terminates in a cascade called **Caldron Linn**. It now flows on to the west and south, enters Strathmore, and joins the Forth, near Alloa.

The length of the Forth, from its source to Alloa, is about 60 miles, and the estuary, which commences there, is about 50 miles long. So that the total length of the river, from its source to the sea, may be estimated at 110 miles. The area of its basin is about 645 miles. The upper course of the river, as we have seen, is through a country beautiful and picturesque. Then from Aberfoyle it flows through a flat district, and its bed is winding and tortuous: this is especially the case below Stirling, where the windings of the river are known as the "links of Forth." The Frith abounds in fish, especially herrings and oysters; and near Stirling, and in several other parts of the river, there are valuable salmon fisheries.

The Tweed.—The Tweed rises in the Lowther hills, in the neighbourhood of Hart Fell, and flows to the north-east until it is joined by the **Lyne**, which flows southward from the Pentland hills. The united stream then flows south-east, and receives the **Ettrick**, with its affluent, the **Yarrow**. The Ettrick rises about two miles from Potburn, which is said to be the highest farm-house in Scotland. It then flows north-east through the beautiful district called Ettrick Forest, and a little above Selkirk is joined by the Yarrow. This stream rises not far from the source of the Annan, and forms a small lake called the *Loch of the Lowes*, which communicates with the larger *Lake of St Mary's*. The mountains here rise in steep dark masses, and have a character of sterner grandeur than is usually met with in southern Scotland. The district called Ettrick Forest is marked by round-topped hills, clothed with grass to their summits. It is now almost destitute of trees, but at one time formed part of the great Caledonian Forest. The parish of Ettrick, near the head waters of the stream, contains a great quantity of peat, full of decayed trees, especially birch and oak.

After receiving the Ettrick, the Tweed flows for a short

distance to the north, and is joined by the **Gala**; then, turning eastward, it receives the **Leader** or **Lauder**. The river then makes a large curve round to its mouth, receiving from the south the **Teviot** and **Till**, and from the north the **Black** and **White Adders**. The **Teviot** rises about 13 miles to the east of **Ettrick Pen**, and running through the rich valley of **Teviotdale**, joins the **Tweed** near **Kelso**. The **Till** rises on the east side of **Cheviot hill** (p. 98), and flows at first to the east; then, turning northward, it receives the waters of the **Beaumont**, which rises in the west side of **Cheviot**, and the united stream joins the **Tweed** a little below **Coldstream**.

The length of this river, including its windings, is about 100 miles. Its basin is bounded by the **Cheviots**, the **Lowthers**, and the **Pentland**, **Muirfoot** and **Lammermuir hills**, and embraces an area of 1870 square miles.

The **Tweed**, from its source to the junction of the **Gala**, flows through a **Silurian** district; then to its junction with the **Teviot**, through the **Old Red Sandstone**, and thence to the sea through a **Carboniferous** district. There is also a change of scenery corresponding with the change in geological character. We have first a wild romantic district, which at one time formed a favourite hunting ground for the kings of Scotland; then we meet with a fine pastoral district, and the country preserves this character until we come to **Kelso**. Lastly, we have a rich agricultural district extending over the lower course of the **Tweed**. The water of this river is remarkably pure and limpid, and it abounds with fish; as a salmon river it is second only to the **Tay**.

The Clyde.—The **Clyde** rises in the **Lowthers**, near **Queensberry hill**, at an elevation of 1400 feet. At first the river flows northward through a very narrow valley, which, however, gradually opens; and from the neighbourhood of the **Tinto hills**, where the river makes a sudden bend to the south-west, it assumes a gently undulating character. The **Clyde** is now joined by the **Douglas**, which flows from the south-west, and immediately

afterwards it forms a succession of beautiful cataracts. The first considerable fall is that of **Bonnington**, which has a perpendicular height of 30 feet. The river then rushes through a rocky channel of about half a mile, and reaches the magnificent falls of **Cora Linn**. Here are three distinct breaks, being together 80 feet in height. About a quarter of a mile lower down is the smaller fall called **Dundaff Linn**; and below **Lanark** are the falls of **Stonebyres**.

The river now takes a north-west course through a comparatively well-cultivated district, and receives in succession the waters of the **Avon**, the **North and South Calder**, the **Kelvin**, and **Cart**. At **Dumbarton**, where it receives the **Leven** from **Loch Lomond**, the Clyde spreads out into a broad estuary which, at **Greenock**, attains a width of four miles. Below **Greenock**, the **Frith** bends to the south and spreads out into an open sea, and at **Ailsa Craig**, where it terminates, is 20 miles broad. Its length to **Dumbarton** is about 98 miles.

The basin of the Clyde may be thus defined. A ridge of high ground runs from the neighbourhood of **Greenock** in a south-east direction, and is continued through the **Tinto hills** to **Queensberry hill**. Another ridge runs northward to the **Pentlands**, and separates the upper courses of the Clyde and **Tweed**. A line drawn from the western extremity of the **Pentlands** to the **Campsie hills**, near **Dumbarton**, will complete the boundary. The basin thus defined embraces an area of 1580 square miles.

The upper course of the Clyde is through a **Silurian** district: **Red Sandstone** rocks appear in the neighbourhood of **Lanark**, and the remaining part of the river basin belongs to the **Carboniferous** system. "Few rivers, perhaps none, can boast of scenery of greater variety of character, or of greater beauty than the Clyde. Above **Glasgow** its course is now through verdant lawns, now through rocky defiles, and now between steep and gorgeously wooded banks. Below the city where it widens into an estuary, lofty hills rise on every side, and bound the far distance: lochs or arms of the sea, resembling

Norwegian fjords, branch off at various points on the north and west sides, carrying the eye into the recesses of the mountainous districts, while the shores are studded with beautiful watering places, the summer resort of the Glasgow citizens: all presenting a panorama of unrivalled beauty, grandeur, and magnificence."—(*Blackie's Imperial Gazetteer.*)

Lakes.—We have already mentioned several of the most celebrated Scottish lakes in our account of the different river-basins. Thus the river Tay drains Lochs Tay, Lydoch, Rannoch, Ericht, and Earn, while Lochs Katrine, Achray, and Vennacher, are in the basin of the Forth. It remains that we should mention one or two other lakes which, though connected with no important rivers, are of considerable importance in themselves; and in doing so we shall commence with the north of Scotland and proceed towards the south. We shall thus notice Lochs Shin, Maree, Ness, and Shiel north of the main chain of the Grampians, and Lochs Awe, Lomond, and Leven south of that mountain-range.

Loch Shin lies in a wild mountainous district, surrounded by wide-spreading moors, destitute of trees or cultivation. It extends from the north-west to the south-east for a distance of about 24 miles, with a breadth of about one mile. Its waters are discharged by the river Shin, which falls into the *Kyle of Sutherland*, a branch of Dornoch Frith, and about three miles below the lake forms a beautiful cascade 20 feet in height.

Loch Maree, lying at a considerable distance to the south-west of Loch Shin, stretches out in a direction parallel to it. Its length is about 14 miles, and its greatest breadth about three miles. The scenery along its shores is of the boldest description, and is said to resemble, in some measure, that of Loch Lomond, the surface of the lake being diversified with a number of small well-wooded islands. Its neighbourhood is the only resort of the grey eagle in Great Britain. The lake discharges its waters into *Loch Ewe*, on the west coast, by a river of the same name.

Loch Ness lies in the northern part of Glenmore (p. 94). It extends from north-east to south-west for a distance of 22 miles, and its breadth varies from one and a quarter to two miles. On each side of the lake rise lofty and rugged mountains averaging about 1000 feet in height. It receives several streams, of which we may mention *Fyers*, which in its course forms the celebrated *Falls of Fyers*, 277 feet in height. At its northern extremity the loch discharges its waters by the river Ness which flows into the Moray Frith. Like Loch Maree it never freezes owing to its great depth.

Loch Shiel, near the west coast and on the borders of Argyre and Inverness, is about 15 miles long and very narrow. It is everywhere surrounded by bare steep mountains, and discharges its waters by a small stream into the sea, near Loch Moidart.

Loch Awe, the second in size of the Scottish lakes, lies to the south-west of Ben Cruachan. It extends from north-east to south-west for about 25 miles, with a breadth of about two miles. It is very deep, and its shores are sloping and well cultivated, but immediately behind rise lofty mountains from which fall many cascades. Above twenty islets are scattered over its surface, on some of which are picturesque ruins. The lake is fed principally by the *Orchy*, which drains the southern part of the Moor of Rannoch; its waters are discharged by the river Awe, which flows through a narrow and deep valley eight miles in length, and empties itself into Loch Etive.

Loch Lomond, the largest lake in Great Britain, is about 24 miles long, with a breadth varying from one to seven miles. It is very irregular in shape, being extremely narrow in the north, and widening very much towards the south. In the northern part of the lake the water is very deep and the shores rocky; Ben Lomond, with its green summit, rising 3200 feet above the sea, adorns the middle part on its eastern side, and towards the south the country is level, rich, and well cultivated. In the lower part of the lake are a number of islands, about thirty in number, most of which are finely wooded

The water is soft and wholesome, and abounds in various kinds of fish. The river Leven, which issues from the southern extremity, flows through a fine open valley about eight miles long, and enters the Clyde near Dumbarton.

Loch Leven, in Kinross-shire, is a small lake, oval in form, and has a circumference of about ten miles. On the east side are the Lomond hills, a branch of the Ochills. Ben Artie is on the south; while on the west side of the lake extends the plain of Kinross, about four miles in length, and the same in breadth. There are four islands in the lake, on one of which is the ruins of the castle where Mary Queen of Scots was confined, and from which she escaped shortly before the battle of Langside (1568). The *river Leven*, which issues from the lake, flows through a fine open valley for about five miles, then winding through the undulating plains of Fifeshire, it empties itself into Largo Bay, a part of the Frith of Forth.

CHAPTER III.

THE RIVERS AND LAKES OF ENGLAND: NORTHERN DIVISION.—THE TYNE—WEAR—TEES—EDEN—LUNE—RIBBLE—MERSEY—DEE—TRENT—OUSE—HUMBER.
—LAKES OF ENGLAND.

In describing the rivers of England and Wales, we shall divide this portion of Great Britain into two parts. The *northern division* will include all rivers to the north of a line drawn from the Berwyn range (p. 104) to the Moors of Staffordshire, and thence following the watershed which divides the basin of the Trent from the basins of the Severn and Wash rivers (p. 100). The *southern division* will include all rivers to the south of that line. In the northern division the principal line of watershed—leaving out the Dee—runs almost due north and south, and through the greater part of its length coincides with

the ridge of the Pennine chain. From the neighbourhood of the Peak in Derbyshire, however, it bends a little westward to the Moors of Staffordshire, and then again turns south-east to the Clent and Lickey Hills.

The rivers of England differ from those of Scotland in being less rapid, less subject to floods, and more navigable. They do not generally rise at any great altitude, and their courses are often long and winding, and free from rocks and cataracts. The principal rivers in the district now under consideration are—beginning at the North—the Tyne, Wear, Tees; Eden, Lune, Ribble; the Mersey, including the Weaver, the Dee; and the Humber, including the Trent and Ouse.

The Tyne is formed by the junction of two streams—the North and South Tynes. The **North Tyne** rises in the angle formed by the Cheviot and Pennine ranges, and flowing south-east, through mountainous heaths and barren wastes, it receives on its left bank the **Reed**. This stream has its source about four miles to the east of the North Tyne, and flows at first to the east, and then southward to its junction. The united stream then flows almost due south, and at Hexham meets the **South Tyne**. This branch rises in swampy ground about seven miles east of Cross Fell (p. 98). It then flows northward through **Alston Moor**—an elevated tract about 1000 feet above the sea—and turning to the east, receives on its right bank the **Allen**, which flows from the lead-mine district of Allendale. From Hexham the Tyne flows eastward to the sea, and about two miles above Newcastle, where it becomes navigable for steam-boats, it is joined by the **Derwent**. This feeder rises not far from the Allen, and has a general direction to the north-east. The total length of the Tyne is about 70 miles, and the area of its basin about 1100 miles.

The Wear.—This river rises in Kilhope Law, an offshoot from the Pennine chain about 2196 feet in height. Its course is at first eastward through a long narrow valley, bounded on the north and south by spurs from the

Pennine range (p. 98). The hilly ground on the north side of the valley is called *Weardale Forest*, and it terminates about three miles south-west of the city of Durham, in an eminence called *Brandon Mount*, which has an elevation of about 875 feet. Between the Wear and the Tees the mountainous tract is known as *Teesdale Forest*, though at present there is scarcely a tree to be seen. At Bishop Auckland the Wear is joined by the *Gaunless*, and then makes a sudden bend to the north. It continues in this direction with a very winding course past Durham, and then turning east enters the sea at Sunderland, about seven miles south of the mouth of the Tyne. The Wear is about 60 miles in length, and its basin has an area of about 460 square miles.

The *Tees* rises in swampy ground, about a mile from the South Tyne. It flows south-east in a long narrow valley, into which lateral valleys open, some of which, as *Deepdale* and the vale of the *Greta*, are very picturesque. In the upper part of its course, near *Caldron Snout*, the *Tees* forms a series of rapids, and about five miles further down, the river is precipitated over basaltic rocks, and forms a cascade known as the *High Force*, which has a height of nearly 70 feet. From the neighbourhood of *Barnardcastle* the *Tees* flows eastward for some distance, and then bends to the south-east, and receives on its left bank the waters of the *Skerne*. The river now flows to the north-east in a very winding course, and at its mouth forms the wide estuary of *Tees Bay*. The *Tees* is about 75 miles in length, and its basin has an area of 744 square miles.

The *Eden* rises in the angle formed by the Cambrian mountains and Pennine chain, not far from the sources of the *Yore* and *Swale*. It flows at first northward through a long narrow valley, and then, turning north-west, drains a large plain, and empties itself into *Solway Frith*. Its chief feeder is the *Eamont*, which is formed by streams rising in the neighbourhood of *Helvellyn*. These streams flow into *Ulleswater*, and issuing from the lake the *Eamont*

flows north-east, and at Brougham Castle is joined by the Lowther. The **Lowther** is formed by two streams, one of which comes from Shap Fell, and the other from Hawes Water. After their junction the Lowther flows northward, and joining the Eamont, the united stream turns eastward and joins the Eden. Another feeder on the left bank is the **Caldew**, which rises near Skiddaw, and joins the Eden at Carlisle, where the river becomes navigable. The Eden has no feeders on the right bank of any importance, as its bed is narrowed by the Pennine chain on the east. The total length of the Eden is about 75 miles, and its basin nearly 1000 square miles.

The **Lune** rises on the southern slope of the Shap Fells, and flows at first to the west; then, turning southward, it flows through a beautiful valley past Kirby Lonsdale, and bending south-west, opens, at Lancaster, into a wide estuary. Its length is about 53 miles, and its basin has an area of 430 square miles.

The **Ribble** rises near Whernside, and flows southward between Ingleborough and Pen-y-gent (p. 98). It continues in this direction for about 20 miles, and then turns to the south-west, and flows through the beautiful valley of Ribblesdale, and at Preston expands into an estuary. Its principal feeder is the **West Calder**, which, rising near the Yorkshire Calder, flows in a north-west direction, and joins the Ribble on the left bank. The length of the Ribble is about 60 miles, and the area of its basin 720 square miles.

The **Mersey**.—This river is formed by the junction of two streams, the Tame and Goyt. The **Tame** rises in *Holm Moss*, not far from the source of the Yorkshire Don: the **Goyt** rises on the northern slope of Axe Edge Hills, near the source of the Dove, and flows northward through a deep romantic dale. At Stockport the Tame and Goyt join, and the united stream flows westward until it is joined by the **Irwell**. This tributary rises in the Lancashire moorlands, near Bacup, and flows southward as far as Manchester, where it is joined by the **Irk** and **Medlock**.

It then turns south-west, and joins the Mersey at Flixton. Turning to the south-west the Mersey next receives the **Bollin** from Cheshire, and then expands into a broad estuary, and into this estuary flows the Weaver.

The **Weaver** rises in the Peckforton Hills (p. 100), and flows at first to the south-east. Then making a sudden bend to the north, it flows in that direction, and at Northwich is joined by the **Dane**, which rises on the west side of the Axe Edge Hills. The Weaver now turns to the north-west, and enters the estuary of the Mersey at Frodsham. This estuary, at its widest part, has a breadth of about three miles; but opposite to Liverpool the distance is contracted to about half a mile. The total length of the river may be estimated at 70 miles; and the area of its basin, including the Weaver, about 1750 square miles.

The **Dee** rises on the eastern slopes of Arran Fowddy, and being joined by two other streams, enters *Lake Bala*. Issuing from the northern extremity of this lake, it pursues its way to the north-east, and is joined on its left bank by the **Alwen**. Its course is now eastward through the beautiful vale of Llangollen, and, entering the Cheshire plain, it soon afterwards changes its direction to the northward, and, having almost surrounded the old city of Chester, enters a broad estuary through an artificial channel cut along the marshes for about nine miles. The estuary of the Dee is about three miles wide at high water, but at ebb-tide it dwindles down to an insignificant stream winding its way through dreary wastes of sand. This river is about 90 miles long, and the area of its basin is about 860 square miles.

The **Trent**.—This river has its source in the northern part of the Staffordshire moorlands, and flows at first to the south. Being joined by the **Sow**, on which the town of Stafford stands, it turns to the south-east, and continues in that direction unto its junction with the **Tame**. This feeder is formed by two streams which unite at Tamworth. The eastern branch, called the **Anker**, rises a few miles

north of Coventry in the high ground running from the Lickey Hills to the southern extremity of the Lincolnshire Heights (see below). The western branch, or Tame proper, rises between Walsall and Wolverhampton, and flows to the south-east. Having approached within two miles of Birmingham, it turns to the east, and is augmented by the waters of the **Blythe**, which flows from the Clent Hills. After receiving this feeder the Tame flows to the north, and, being joined on its right bank by the Anker, continues in the same direction and joins the Trent.

The Trent now turns to the north-east, and, flowing past Burton, where it becomes navigable, is joined on the left bank by the **Dove**. This tributary rises in the *Axe Edge Hills*, not far from the sources of the Dane and Goyt, and flows for some distance southward through the picturesque valley of Dovedale, and then, turning to the south-east, flows into the Trent. This river now flows in a north-easterly direction, and receives on its left bank the Derwent, on its right the Soar. The **Dorwent** rises in the highlands near Holme Moss, east of Manchester, and flows almost due south to Derby, being augmented on its course by the **Wye**, which joins it on the right bank. From Derby the Derwent flows south-east until it joins the Trent. The **Soar** rises in the *Central table-land* of England, not far from the source of the Anker, and flows in a general direction towards the north.

The Trent now flows in a north-east direction past Nottingham, and at Newark is joined on the right bank by the **Devon**. From Newark the river runs almost due north through a very narrow valley bounded on the east by the *Lincolnshire Heights*, a range running parallel to the Wolds of Lincolnshire. There are no feeders of any importance on the right, but on the left it receives the **Idle** and **Torne**. The total length of the Trent is about 180 miles.

The Ouse.—This river is formed by the junction of two streams, the Swale and Yore or Ure. The **Swale** rises in the Pennine chain at Shunnor Fell, and flows south-east

to its junction with the **Yore**. The united stream, under the name of Ouse, now continues in a south-easterly direction, and receives the **Nidd**. This feeder also rises in the Pennine chain, but its course is much shorter than the other feeders of the Ouse. At York, where the Ouse is joined by the **Foss**, the river turns to the south, and is next joined by the **Wharf**. This beautiful stream rises not far from the Ribble, and, flowing in a south-easterly direction, joins the Ouse on the right bank. The river now curves round to the estuary of the Humber, and receives on the way the waters of the Derwent, the Aire, and the Don.

The **Derwent** rises in the North York Moors (p. 99) about three miles south-west of Robin Hood's Bay. At first it flows due south until it enters the Vale of Pickering, when it turns to the east for some distance; and then, bending to the south, continues in that direction to its junction with the Ouse. The **Aire** rises in a fine sheet of water called Malham Tarn, and runs underground for about a mile, then, issuing from an amphitheatre of limestone rocks, its course is south-east till it joins the Ouse. On its way it receives the important stream the **Calder**, which has its source in the same marsh from which rises the West Calder, a feeder of the Ribble. It flows then in an easterly direction through the romantic vale of Todmorden, and joins the Aire on its right bank at Castleford. The **Don** rises near the sources of the Tame and Derwent, and flows at first in a southerly direction as far as Sheffield: here it receives the **Sheaf**, a small right-bank tributary. It then turns north-east, and, receiving the waters of the **Rother** on the right bank, and the **Dearne** and **Went** on the left, joins the Ouse a little below the junction of the Aire. The total length of the Ouse is about 150 miles: the Ouse is navigable for steamboats as far as Selby, and the tide is felt at York.

The district lying between the lower courses of the Ouse, Don, and Trent forms an immense swamp, covered with heath, and so soft that in some places it will not bear

a sheep. These mosses supply large quantities of peat; they are only passable on foot, and there is hardly a bush or a tree to be seen. The waste covers an area of ten or twelve thousand acres.

The course of the **Humber**, below the junction of the Trent and Ouse, is rather winding, and it contains some sandbanks. Two small streams join the estuary from opposite sides—the Ancholme and Hull. The **Ancholme** flows from the south in a depression between the Lincoln Heights (p. 121) and the Lincolnshire Wolds; the **Hull** rises in the Wolds of Yorkshire. At the mouth of this latter stream the Humber is three miles wide; it then gradually expands, and at Spurn Head its width is five miles. The distance from the confluence of the Ouse and Trent to the sea is nearly 40 miles.

The basin of the Ouse and Trent is bounded on the west by the Pennine chain, the moors of Staffordshire, and the table-land of Birmingham. On the south a ridge of high ground running from the Clent Hills to the southern extremity of the Lincoln Heights, separates it from the basin of the Wash rivers. The Wolds of Lincoln and York, with the North York moors, from its eastern boundary and the high ground south of the Tees, separate it from the basin of that river. The basin of the Ouse alone has an area of about 4800 square miles; the basin of the Trent may be estimated at 4000. And, if we add the drainage of the Humber, we have a total of not less than 10,000 square miles.

In tracing the courses of the rivers in this part of England, we must have noticed two things,—first, that the streams generally flow in a southern direction; secondly, that their sources are ranged, as it were, in clusters round some central point. The Eden and Trent are exceptions to the first statement; but in the principal feeders of the latter stream the rule holds. With respect to the sources of the rivers in this district, we find three main centres. In the neighbourhood of Cross Fell rise the South Tyne, the Derwent (Tyne), the Wear, and the

Tees; near the junction of the Cumbrian Mountains with the Pennine chain rise the Swale, Yore, Wharfe, Ribbles, Lune, and Eden; and in the neighbourhood of Holme Moss, the Tame, Goyt, Dane, Dove, Derwent (Trent), and Don rise.

Lakes.—The lakes of England are mostly among the Cumbrian Mountains. They are all of them small when compared with the lakes of Scotland, but are celebrated for their picturesque beauty and variety. The axis of the Cumbrian Mountains runs east and west at right angles to the Pennine chain, and the lakes lie on the north and south sides of the axis, in valleys radiating from it at various angles. Commencing on the north side, and mentioning these lakes in order, we have Hawes Water, Ulleswater, Derwent Water, Bassenthwaite, Thirlmere, Buttermere, Crummock Water, Lowes Water, Ennerdale, West Water, Conistone, and Windermere.

Hawes Water is a small lake, about two miles and a half long, but very beautiful. It is connected by a small stream with the Lowther, which is a branch of the Eamont (p. 118). **Ulleswater** is in the valley of the Eamont, and is the second English lake in magnitude. Its shape is somewhat in the form of the letter S, and it is eight miles long, and three quarters of a mile broad. The scenery is wild and grand: steep and craggy hills approach close to the water's edge, while barren mountains, with here and there green valleys between, surround it.

Derwent Water lies about nine miles to the west of Ulleswater; it is about three miles long, and a mile and a quarter broad. It is oval in shape, and lies embedded in rugged mountains. Its water is clear and transparent, the surface varied with islands, on one of which a mansion is erected, and the whole scenery is strikingly beautiful. The river Derwent, which drains this lake, on issuing from its northern extremity, is joined by the Greta, which drains lake **Thirlmere**. This is a narrow lake, about three miles long, lying on the western side of

Helvellyn. Its shores are bare and rocky, and the scenery wild, but not desolate. The Derwent, after being joined by the Greta, flows into **Bassenthwaite** lake. This lake is about four miles long, and about three-quarters of a mile broad: it lies on the western side of Skiddaw, and the scenery is varied and beautiful. At Cockermouth the Derwent is joined by the Cocker, which is the outlet for the lakes Buttermere, Crummock, and Lowes Water. **Buttermere** is about a mile and a quarter long, and about half a mile broad. It is separated from Crummock Water by a low tract of meadow land about a mile in length. **Crummock Water** is about four miles long: its water is deep and clear, and abounds in char. The western side is bounded by lofty and rugged mountains, but the eastern margin is diversified with bays, plantations, and tracts of cultivated land. **Lowes Water** lies a little to the north of Crummock Water, and is about the same size as Buttermere.

Ennerdale Water lies nearest to the coast of all these lakes; it is surrounded by wild and craggy heights, and extends east and west for about three miles, with a breadth of about half a mile. Its waters are discharged into the Irish Sea by the river Ehen. **Wast Water** lies on the south side of the main axis of the mountains, at the foot of Sca Fell. It is about the same size as Ennerdale lake, and empties itself into the sea by the river Irt. **Coniston Water** is in Furness, a detached part of Lancashire. It extends north and south for a distance of six miles, with an average breadth of half a mile, and is connected by the river Crake with the estuary of the Leven, in Morecambe Bay.

Windermere is the largest lake in England, and is about eleven miles long, and from one to two miles broad. The lake lies in a long narrow valley, surrounded by hills of no great elevation; and its scenery, though beautiful, is not grand. The shores of the lake consist of verdant slopes: the water is exceedingly pure and transparent, and the surface is studded with about a dozen islands.

Grassmere and **Rydal Water** are two small but beautiful lakes to the north of **Windermere**, and are connected with it by a small stream. **Esthwaite Water** is another small lake, lying between **Coniston Water** and **Windermere**. It is connected with **Windermere** by a small stream called **Cunsey Beck**. **Windermere** discharges itself by the **Leven** into **Morecambe Bay**.

CHAPTER IV.

THE RIVERS OF ENGLAND AND WALES: SOUTHERN DIVISION.—THE WASH RIVERS—THE YARE—THAMES—SALISBURY AVON—EXE—SEVERN—WYE—USK—LOWER AVON—PARRET.

In noticing the remaining rivers of Great Britain, we find there are three large basins—those of the Wash rivers, of the Thames, and of the Severn, and several smaller rivers flowing between these. The boundaries between the three basins have been already indicated (p. 100): we shall begin, therefore, at once with a detailed account of the rivers, and in doing so, shall commence with those of the Wash.

The **Witham** rises in a ridge of high ground about five miles north of **Oakham**. It flows for a considerable distance due north, and, then bending to the west, enters the valley of the **Trent**. Its course is now north-east as far as **Lincoln**, where it is joined on the left bank by the **Till**, which is connected with the **Trent** by an old cut called **Fosdyke**. The **Witham** now flows for some distance eastward through a valley dividing the **Lincolnshire Heights**, and then, bending south-east, enters the **Wash**. The total length of this river is about 75 miles, and the area of its basin 1050 square miles. It is navigable to **Lincoln**.

The **Welland** rises in the *Central Plain*, near the source

of the Warwickshire Avon, and flows with a general direction to the north-east, to its embouchure in the Wash. The low land near its mouth is called Holland, and, like its continental namesake, is protected from the sea by embankments. The Welland is about 60 miles long, and the area of its basin is about 700 miles.

The **Nen** also rises in the Central Plain, not far from the Cherwell, a feeder of the Thames. Its course is at first eastward to Northampton, where it is navigable. It next flows for a considerable distance to the north-east, then, turning again to the east, enters the Fen district; and, finally, again flowing north-east, enters the Wash. Its length is about 85 miles, and the area of its basin 1132 miles.

The **Great Ouse** rises on the borders of the counties of Northampton and Oxford. It flows at first to the north-east, and then, bending south, its course becomes very winding and tortuous for some distance. Passing Bedford, where its navigation commences, it receives on its right bank the **Ivel**, which flows from the *East Anglian Heights*. The river then flows to the north, and, turning eastward, is joined by the **Cam**, which rises in Essex. The Ouse now flows northwards, and is fed by the **Lark**, the **Little Ouse**, and the **Stoke**, all on the right bank. From Huntingdon to Denver Sluice, a little below the junction of the Stoke, there is a canal called New Bedford River, and the greater portion of the water of the Ouse goes through this channel. About three miles from its mouth, the river formerly made a great bend, which obstructed the outfall of the water: this, however, has been remedied by a straight cut called the Eaubrink canal, which is about two and a half miles long. The total length of the Great Ouse is about 150 miles, and the area of its basin about 3000 square miles.

The whole basin of this river, as indeed of all the Wash rivers, is flat, the source of the river being only 260 feet above the sea-level. Hence no other river in England flows through such a large extent of level country,

or has such a winding course. The scenery of the upper part of its basin is pleasing and diversified, and the country is well suited for agriculture; but in the lower part, where it forms a portion of the Fen district, the country is tame and flat.

There is abundant evidence to prove that at one time a great portion of the Fen district was well wooded and cultivated. Trees have been frequently found under the surface, with their roots firmly fixed in the soil where they grew; grass lying in swathes as when first mowed, with boots and shoes of a pattern worn in the time of Richard II., have been discovered eight feet below the present surface. It appears that, previous to the Roman invasion, the sea, at spring tides, overflowed very extensive tracts of low land lying round the Wash; but most of the water was carried back to the sea by the channels of the Ouse, Nen, and Welland. Subsequently the beds of the rivers became obstructed, and therefore could not drain the inundated tracts as formerly; the water would then stagnate, and the country rise above its former level. Before the Reformation a large portion of the Fens belonged to rich religious houses, and drainage seems to have been conducted with considerable success. Afterwards the dykes and drains appear to have fallen into decay, until the subject was taken up by the Earl of Bedford, in the time of Charles I. He cut the old Bedford River; and the new Bedford River, which runs parallel with it, was excavated some years later. Great improvements have been made since, and a great part of Bedford level has been brought under cultivation, and produces grain and flax in considerable quantities; "but there is still sufficient fenny land to yield a rich harvest of wild-fowl in winter for the London market."

The rivers flowing eastward, between the basins of the Wash and Thames, are not of great length, and are of little importance; the principal of these is the Yare, with its tributaries.

The Yare.—The longest branch of this river is the

Wensum, which rises in the north-west part of the county of Norfolk and flows south-east to Norwich, a little below which it is joined by the Yare proper, which rises near the middle of the county. The united stream now runs in a curve to Yarmouth, where it enters the sea. A short distance above its mouth it falls into *Braydon Water*, a sheet of almost stagnant water, about three miles long and one broad. At the eastern extremity of this lake or *mere*, the Yare receives the **Bure** or **North River**, which rises in the northern part of the county; and at the western extremity it receives the **Waveney**, which rises near the source of the Little Ouse, and forms the boundary between Norfolk and Suffolk.

The other rivers flowing into the sea between Yarmouth and the estuary of the Thames are not of great importance. The principal of these are the **Alde**, **Orwell**, **Stour**, **Colne**, and **Blackwater**, with the **Chelmer**. We shall next describe the course and basin of the Thames.

The **Thames** has its source in four rivulets which rise on the eastern slope of the Cotswold Hills—the **Lech**, the **Colne**, the **Churn**, and the **Isis**. The **Churn** rises about three miles from Cheltenham, and, flowing south-east, joins the **Isis**, which rises in Thames Head. Flowing now to the north-east, the **Isis**, as the united stream is here called, receives the waters of the **Colne** and **Lech**, and becomes navigable for barges. Continuing in the same direction, it is next joined by the **Windrush** and **Evenlode**, which also rise in the Cotswold Hills. The river now bends to the south, and at Oxford is joined by the **Cherwell**, which rises in the Central table-land, not far from the source of the **Nen**. A little further south the river makes a bend to the east, and receives the **Ock**, which drains the *Vale of the White Horse*.

This vale receives its name from a large figure of a horse which is cut in the brow of a chalk hill near Wantage. The horse is represented in a galloping position, and covers nearly an acre of ground. At stated periods—

"Men weed the white horse on the Berkshire Hills,
To keep him bright and clean as heretofore."

This custom of "scouring the white horse" is attended with a rustic festival.

The Isis, after receiving the Ock, is next augmented by the waters of the **Thame**, which rises on the western slope of the Chiltern Hills, and, having drained the fertile *Vale of Aylesbury*, joins the Isis on its left bank. The united stream—now called the Thames—next bends round the southern extremity of the Chilterns, and is joined on its right bank by the "**Kennet** swift, for silver eels renowned." This feeder rises in *Marlborough Downs*, and, flowing to the east, joins the Thames at Reading. The main stream now bends to the north, and then, flowing eastward for some distance, turns to the south-east, and receives the **Colne** on its left bank, and the **Wey** and **Mole** on its right. The **Colne** rises in the Chilterns, near **Kensworth Hill**; the **Wey** rises in Hampshire, and, after crossing the North Downs, flows northwards to its junction with the Thames. "The sullen **Mole** that *runneth underneath*" rises in Sussex, and flows at first north-west through a flat country. It then passes through a beautiful valley in the North Downs, where in dry weather it disappears altogether for some distance, and flows underground.

The Thames now flows northward, and is joined by a small stream called the **Brent**. It then turns to the east, and, passing London, receives in succession the **Lea** and **Roding**, **Darent** and **Medway**. The "*sedgy Lea*" rises in the Chalk hills, near **Luton**, and, after flowing to the south-east and then south, joins the Thames near the **East India Docks**. The **Medway** was called by the ancient Britons *Vaga*, because of its winding course: to this term the Saxons prefixed the syllable *Mað*, meaning mid or middle, because the river ran through the middle of the kingdom of Kent; hence it came to be called **Medwey** or **Medway**. A branch of this feeder, together with the main stream, forms the Isle of **Sheppey**. The total length of

the Thames is about 215 miles; and the area of its basin exceeds 6000 miles.

The Thames is navigable to Lechlade, a distance of more than 200 miles. Ships of the largest size can reach London, and steam-boats can ascend the river to Hampton Court, seven miles above Richmond.

In tracing the boundary of the Thames basin we commence at a low range of hills in the county of Essex, called the *Essex Heights*. A line drawn from this range northward, between the Chelmer and Roding, will reach the source of the Cam. We now turn a little north-west, and reach the East Anglian Heights, then follow the crest of that range to Kensworth hill, near the source of the Lea. A line drawn north-west, from Kensworth hill to the Edge hills, will indicate the water-shed between the Nen and Ouse, and the Thame and Cherwell. We now follow the direction of the Edge hills and the Cotswolds as far as Thames Head; and then a line to the south-east reaches the Marlborough Downs and the source of the Kennet. Lastly, a line from Marlborough Downs to the south-east, past Inkpen Beacon, in Berkshire, and along the *Wealden Heights* to Dover, will separate the right-bank feeders of the Thames from the streams which flow into the English Channel. The scenery in many parts of the basin of the Thames is very pleasing, and the soil is generally well suited to agriculture. In the neighbourhood of London, beds of clay are found, and the soil is better suited for grain than pasture; large tracts of ground, especially on the south side, are also devoted to gardens. The Thames is neither a rapid river nor yet sluggish, and—above London—it is noted for the purity of its waters. It has been well described by Denham—

“Though deep, yet clear; though gentle, yet not dull;
Strong, without rage; without o’erflowing, full.”

The principal rivers flowing into the English Channel are the **Rother, Ouse, Arun, Anton or Test, Avon, Exe, Dart, and Tamar**. Of these, the Avon and Exe alone require a more detailed notice.

The **Avon** rises near Devizes, in Wiltshire, and, flowing southward, is joined by the **Wily** on its right bank. Then entering Hampshire it empties itself into Christchurch Bay, which also receives the waters of the **Stour**. The **Exe** rises at Exhead, about five miles from the southern shore of the Bristol Channel. It crosses Exmoor (p. 103) in a south-easterly direction, and then its course is almost directly south to the sea. After leaving Exmoor it flows for some distance through a richly wooded valley; and a little lower down is joined by the **Culm**, which rises in the Blackdown Hills (p. 103). Below Exeter it flows for some distance through rich meadow lands, and then expands into a broad estuary. Its total length is about 55 miles.

The remaining rivers of Great Britain have a western drainage, and the principal of these are the Severn, Wye, Usk, Avon, and Parret; all of which flow into the Bristol Channel. Besides these we may mention the **Taff** and **Towy**, which drain the south part of Wales; the **Teify** and **Dyfi**, which flow into Cardigan Bay; and the **Conway** and **Clwyd**, which flow northward into the Irish Sea.

The Severn.—This river rises on the western slope of Plynlimmon (p. 104) in two sources. The southern one, called the **Hafren**, flows from a small lake about a mile from the source of the Wye, whence it descends as a mountain torrent, and joins the other branch at Llanidloes. Here the united stream takes the name of Severn, and flows north-east through the *Vale of Montgomery*, and enters the *Plain of Salop*. The Severn is here joined by the **Vyrnwy**, which is formed from two branches, one of which rises in the Berwyn range (p. 104), and the other in a ridge connecting the Berwyn range with Plynlimmon. The river now flows eastward in a very tortuous course, and a little below Shrewsbury receives the **Tern** on its left bank. Soon after this it flows through a narrow valley between Wenlock Edge and the Wrekin, and then, flowing southward, enters the *Vale of Worcester*. In this part of its course the river receives the **Stour** on its left bank,

and the Teme on its right. The Teme rises in the Plynllymmon range, and has a quick descent, with numerous rapids, rocky ledges, and deep pools.

The Severn is now a broad and deep river, and flows through a pleasant and fertile country. Soon after entering Gloucestershire it receives the Avon. This feeder rises at Naseby, in Northamptonshire, near the source of the Welland, and flows south-west through a long tract of level country. On its way it is joined by the Leam and Stour, both on the left bank, and joins the Severn after a course of nearly 100 miles. The course of the Severn is now very winding, and at the *Vale of Berkeley* it expands into a large estuary. Its total length is about 240 miles; and the area of its basin about 5500 square miles. The Severn is navigable to Welshpool, about 60 miles from its source, and steam-boats ascend to Gloucester, which is also the limit of the tide-water.

The upper part of the Severn's basin, from its source to Shrewsbury, is through a mountain district; the remainder of its course is through the valley of the Severn, a continuation of the Cheshire plain (p. 99). This valley is distinguished in different parts as the Vale of Worcester, the Vale of Gloucester, and the Vale of Berkeley. The Vale of Evesham, watered by the Avon, opens into the valley of the Severn on the east. All these valleys have a rich soil, and are distinguished by great natural beauty.

The Wye rises on the south-eastern side of Plynllymmon, about a mile from the source of the Hafren, and flows at first in a south-easterly direction. The first part of this course is through a narrow and rocky channel, between dreary mountains, destitute of trees, and covered with mosses and peat. Below Rhayader, however, the scenery improves, and after the river has entered the Old Red Sandstone district it becomes extremely beautiful. "Flowing in a fine valley, with a flat in general sufficiently wide for all purposes of utility and comfort, between ranges of woody hills, it sometimes presents a rapid and foaming current, and at other times a deep dark pool, with scarcely

any appearance of motion on its surface."—(*England and Wales by Long and Porter.*)

Soon after entering the Red Sandstone region, the river bends to the north-east; then, turning to the east, it leaves the mountains of Wales and enters the rich undulating country of Hereford. A few miles below Hereford it is joined on the left bank by the **Lug**, which is formed by two branches, one of which rises on the north and the other on the south of *Radnor Forest*. The Wye now flows to the south in a very tortuous course, and the scenery is bold and very romantic. At Monmouth it is joined on the right bank by the **Munnnow**, and then, continuing its course on the western side of Dean Forest, enters the estuary of the Severn at Chepstow. The total length of this river is about 120 miles, and the area of its basin 1500 square miles. It is navigable to Hereford.

The **Usk** rises in a lake, about a mile in length, lying on the northern slope of the Black Mountains or Forest Fawr. It flows for a short distance to the north, and then, turning eastward, drains the valley lying between Forest Fawr and the Epynt hills (p. 105). At Brecknock it turns to the south-east, and continues in that direction to Abergavenny, when it flows southward through the undulating plains of Monmouth, and enters the Bristol Channel—an expansion of the estuary of the Severn—a few miles below Newport. Its length is about 70 miles, and the area of its basin about 630 miles.

The **Avon** rises on the eastern slope of the Cotswolds, not far from the source of the Isis, and flows in a general direction to the south until its junction with the **Frome**. It then turns west, and passing Bath, where it becomes navigable, flows through a beautiful valley on to Bristol, and after a further course of about ten miles, enters the Bristol Channel. Its whole length is about 65 miles, and the area of its basin 900 miles.

The **Parret** has its source in the Dorset Heights, and flows at first north-west. On its right bank it is joined by the **Yeo**, and, continuing north-west, next receives the

Tone, which flows through the beautiful *Vale of Taunton*. Near the junction of the **Tone** is a small spot of rising ground which marks what was once the *Isle of Athelney*, where **Alfred** found a retreat during the Danish invasions. The **Parret** now continues its course to the north-west, and, flowing past **Bridgewater**, enters the **Bristol Channel** at **Bridgewater Bay**. Its total length is about 45 miles, and the area of its basin about 650 miles.

CHAPTER V.

COAST LINE OF GREAT BRITAIN.

We shall commence at **Cape Wrath**, which is the north-western point of the island. The cliffs here are very magnificent, in some cases overhanging the sea to the height of 600 feet. From this point the coast runs eastward to **Duncansbay Head**, and preserves its bold and rocky character. This portion of the coast is separated from the group of the **Orkney islands** by the **Pentland Frith**; navigation is here very dangerous, and the tidal wave flows with great violence, sometimes running nine miles an hour. Rounding **Duncansbay Head** the coast trends to the south-west, and the shores are still lofty and bold, as the mountains come down to the water's edge. At the **Ord of Caithness**, however, this rocky character ceases, and a low sandy shore commences. We now reach **Dornoch Frith**, round the point of **Tarbetness**, and come to the **Frith of Cromarty**. This inlet is about a mile wide at its entrance, and stretches inland in a south-west direction for a distance of about 17 miles. It is without doubt the finest natural harbour on the east coast of Great Britain. Adjacent to the **Cromarty Frith** is the still larger inlet of **Moray Frith**, which is united to the **Caledonian Canal**.

The coast now stretches eastward as far as **Kinnaird's**

Head. There are no inlets of any importance, and the coast is for the most part low and sandy, though it becomes rocky towards its eastern extremity. Rounding **Kinnaird's Head**, the coast now stretches away to the south-west, as far as the **Frith of Tay**. A little to the south of **Kinnaird's Head** is **Buchanness**, the most easterly point in Scotland, and near this headland are the famous arched rocks known as the **Bullers of Buchan**. Continuing south, the shores are for the most part bold and rugged, and in some parts penetrated by tremendous caverns. Nearly opposite to the **Frith of Tay** is the **Bell Rock**—an insulated ridge, about 800 yards long by 100 broad. At low water some of the summits appear from four to eight feet above the level of the sea, but at high water the rocks are covered. Many wrecks have taken place upon this ridge, and a lighthouse has, therefore, been erected on one of the points.

The peninsula of **Fife** lies between the **Friths of Tay and Forth**: the shores are, in general, rocky, though not high. The estuary of the **Forth** is about 10 miles wide at its entrance, but its width increases soon afterwards. There is good anchorage ground in many parts, but not a single good harbour. The shores are, in some places, rocky, and everywhere beautiful. At the entrance to the frith, on the south side, stands the **Bass Rock**. This rock is of a conical form, and rises to the height of 400 feet; its sides are very steep, and it is inaccessible except towards the south. The coast now trends to the south-east, and is low to within a few miles of **St Abb's Head**. This promontory terminates the range of the **Lammermuir** hills, and is rocky in character. It is separated from the ridge by a narrow dell, and hence at a distance has the appearance of an island. The shores now assume a bolder character, and rocky cliffs stretch as far south as **Berwick**.

A sweep of sandy shores lies between **Berwick** and **Bamborough Castle**, which stands upon a bold cliff, and from thence rocky shores appear until we reach **Flamborough Head**. Opposite **Bamborough Castle** is a group

called the **Fern Isles**, and a little to the north of them is **Holy Island**. The whole coast from the Frith of Forth to Flamborough Head is bleak and inhospitable, and destitute of any harbours, except those formed by the mouths of rivers. Of these estuaries, the mouth of the **Tees** is the most important, and several flourishing ports have arisen in its neighbourhood. **Flamborough Head** is the most conspicuous headland on the east coast of England. It is composed of high cliffs of chalk which project far into the sea, and is crowned with a lighthouse, which has a lantern elevated 214 feet. On the north side are vast caverns, hollowed out by the action of the waves, which afford a retreat for immense numbers of sea-fowl; on the south is the spacious harbour of **Bridlington Bay**, protected on the east by a sandbank, called the *Smithie*.

From Flamborough Head the coast trends to the south-east, and consists of clay and gravel. The sea is continually wearing away this part of the coast: the site of Ravenspur, where Bolingbroke landed (1399), has now quite disappeared; and Hornsea, which is now on the coast, was at one time six miles inland. Indeed, there is reason to fear that the promontory of **Spurn Head**, which stands at the entrance of the Humber, will eventually be swept away. The coast of Lincoln, lying between the Humber and the Wash, is an unbroken curve, and is everywhere low: this character also continues round the **Wash** to **Hunstanton Cliff**, which terminates the range called the East Anglian Heights. The Wash is surrounded on all sides by Fens, and is filled up by immense sandbanks, the summits of which appear at low water. The channels of navigation are very difficult to follow, and require experienced pilots. Hunstanton Cliff is 80 feet in height, and consists of cliffs of sandstone and chalk: on its summit a lighthouse has been erected.

The coast of Norfolk and Suffolk curves round first to the east, and then to the south and south-west, and is composed in some parts of low cliffs of clay, chalk, and gravel, and in others of long low stretches of sand.

Wherever the cliffs are found the sea is gaining upon the land by wearing away and undermining the rocks; but the low sandy tracts are, on the contrary, encroaching upon the sea. The site of the ancient Cromer is now beneath the waves of the German Ocean, and the sea now threatens the more inland situation to which the inhabitants retreated. On the other hand, the site upon which Yarmouth stands was neither firm nor habitable previous to the Conquest; and in the 13th and 14th centuries, Norwich is represented as standing upon an arm of the sea. The Suffolk coast terminates at the mouth of the Stour, opposite to Essex, where stands Harwich, which possesses the best port on the east coast of England.

A little south of Harwich is the **Naze**, the most easterly point of Essex. This coast has a general direction to the south-west, and is deeply indented by the estuaries of several rivers. Throughout, it is low, flat, and marshy, and skirted with sandbanks; the opposite coast of Kent is also low and marshy. When the Romans held England, **Thanet** was a complete island, as the two branches of the Stour which divide it from the mainland, were from one to four miles wide, and indeed these channels formed the ordinary route to London for ships coming from the south. As late as the fifteenth century it was usual for boats to pass to and fro; but gradually sand accumulated, dykes were formed by the inhabitants to keep back the tide, and so successful were they in this that Thanet is, at most now, a peninsula. **North Foreland**, at the north-east corner of the isle of Thanet, is the most easterly point of the Kentish shore; from thence a low coast stretches southward to **South Foreland**. About seven miles distant from the shore, and parallel with it, lies a long range of sands, stretching about 10 miles from north to south, with a varying breadth, sometimes amounting to three miles. These banks—the well known **Goodwin Sands**—are laid bare in many places at low water, and an old tradition says that they were formerly united to the mainland, and formed part of the extensive estates

of Earl Goodwin, the father of Harold. The land is supposed to have been submerged about the end of the reign of Rufus, or the beginning of that of Henry I. The Goodwin Sands are very dangerous, and frequent shipwrecks take place; but the roadstead called the **Downs**, which lies between the bank and the shore, affords a safe and sheltered retreat. As we approach Dover, chalk cliffs begin to appear; but, as they have been undermined by the sea, they no longer present the steep and dizzy appearance they did in the time of Shakspeare.

The coast now runs to the south-west, and gradually subsides into the low tract called Romney Marsh (p. 103). Rounding **Dungeness**, and following the trending of the coast, we continue in a south-west direction until we reach **Beachy Head**, a bold promontory of chalk cliffs which rise to a perpendicular height of 564 feet. A long sweep of shore, backed by the South Downs, brings us to **Selsey Bill**, where the character of the shore changes considerably. The south coast hitherto has been destitute of good harbours, but deep and frequent indentations now occur and continue at intervals until we reach Land's End. Rounding Selsey Bill, and turning north-west, we arrive at **Portsea Isle**, on which stands Portsmouth. The harbour of Portsmouth has only a narrow entrance, but within, its width increases; it is well sheltered, has a great depth of water, and good anchorage ground. Adjacent to it, and between the Isle of Wight and the coast of Hampshire, is the celebrated road of **Spithead**, which from its size and safety has been called by sailors "The King's Bed-chamber." **Southampton Water** is another large inlet on this part of the coast, and stretches inland upwards of 10 miles. It is navigable to the head for vessels of considerable burden, and its shores are beautiful and picturesque. The channel between the Hampshire coast and the western side of the Isle of Wight is called the **Solent**, and has an average breadth of about two miles; though a little to the north of the point called the **Needles**, which forms the western extremity of the island, the channel is

considerably narrowed by a long, low, narrow tongue of land which projects in a south-easterly direction from the mainland, and upon the extremity of which stands Hurst Castle. At high water this causeway is scarcely 200 yards broad, and forms a sterile beach covered with loose stones and gravel.

The coast now curves round to **Poole Harbour**, which is a large basin or pool, including several islands. The harbour is nearly land-locked, and exhibits the curious phenomenon of having two tides in 12 hours.

Immediately south of Poole harbour is the so-called **Purbeck Isle**. This place is celebrated for its quarries of limestone which takes a beautiful polish, and is known as Purbeck marble. The most southern point of this isle is **St Alban's Head**, and hence the shore runs westward to Weymouth. Here we meet with a long curious tongue of land known as **Chesil Bank**. This ridge runs almost parallel with the shore for a distance of nine or ten miles, and rises from 20 to 30 feet above high-water mark. It is, in some places, about a quarter of a mile broad, is covered with pebbles, and terminates in Portland Isle, which contains the bold headland known as **Portland Bill**. It is difficult to account for the formation of Chesil Bank, but it seems to resemble the *Nehrungs* found on the Prussian shores of the Baltic. **Portland Isle** supplies excellent building stone. From Portland Bill the coast curves round to Torbay; and gradually assumes a bold and rocky character. **Torbay** is a beautiful semicircular sheet of water bounded on both sides by rocky cliffs, between which the central shore forms the termination of a vale which slopes gently from the interior to the water's edge. The coast now stretches southward to **Start Point**, when it turns north-west, and rocky and deeply indented shores continue to **Plymouth Sound**. This large estuary, formed by the confluence of the Tamar and Plym, has been completely sheltered from the heavy swell thrown up from the south, by the construction of a gigantic breakwater of about a mile in length, which stretches right across the sound, and

thus the water within the barrier has been rendered one of the safest roadsteads in the world. Nearly opposite Plymouth Sound, about nine miles to the south, is the famous Eddystone Lighthouse, finished 1759.

We have now entered upon the coast of Cornwall, which has a general direction to the south-west. There is nothing of importance to notice until we come to **Falmouth Harbour**: this is a spacious creek having good anchorage, and as it is situated just within the channel, it affords a convenient place for ships outward bound, where they may wait for a favourable wind. From Falmouth, across the mainland to Portreath, the distance is only 12 miles, and the country to the south-west may be looked upon as forming two peninsulas with the large expanse of **Mount's Bay** between them. One peninsula terminates in **Lizard Point**—the most southerly point in Great Britain—the other terminates in **Land's End**, which is the most western extremity of England. About 30 miles west of this point is the group called Scilly Islands, upon one of the largest of which a lighthouse has been erected. Great changes have taken place in this part of the coast; the **Scilly Islands** are supposed to have been united to the mainland at one time by a long narrow ridge: and there is a tradition that **St Michael's Mount**, now an insulated rock in the bay to which it gives its name, was at one time situated in a wood several miles from the sea.

The coast of Cornwall and Devonshire now stretches north-east as far as **Hartland Point**, and is of a bold and rocky character. Crossing **Bideford Bay** the shore runs eastward, and the rocky character continues as far as the bay of **Minehead**, when it becomes low and marshy (p. 101). The shores on the opposite side of **Bristol Channel** are of the same nature, but as we proceed to the west they gradually become rocky and deeply indented. From the mouth of the Usk the coast curves round to **Swansea Bay**; then, passing **Worm's Head**, we come to the capacious bay of **Caermarthen**: another sweep round **St Gowan's Head** brings us to **Milford Haven**. This is

one of the most capacious and safest natural harbours in the British Islands. It consists of a large basin branching out into many bays, creeks, and roads. It is deep, sheltered, and affords good anchorage: however, being at a considerable distance from France, it is not suitable for a naval station, and the barrenness of the surrounding country has hitherto prevented it from becoming of any commercial importance. To the north of Milford Haven is **St Bride's Bay**, beyond which is **St David's Head**. The coast now inclines for some distance to the north-east, and, after passing **Strumble Head**, it takes a large curve, and forms **Cardigan Bay**. Along the whole of this curve, which extends to **Bardsey Point** in Caernarvonshire, there is not a single good harbour, and the shores are wild and rocky. The southern part of Caernarvonshire forms a peninsula, the coast of which is noted for its ruggedness and elevation. To the north-west lies the Island of **Anglesey**, on the western side of which is the peninsula of **Holyhead**. As Holyhead is a packet-station, and the nearest port to Ireland, it became of some importance that access to it should be as expeditious and convenient as possible: and as the ferry across the Menai Strait, which separated Anglesey from the mainland, was attended with some danger, it was determined to erect a bridge across the Strait, and hence a magnificent chain bridge was constructed: this was finished in 1825. Since that time a tubular bridge has been erected by the late Robert Stephenson at a cost of £600,000.

From the island of Anglesey a large concave curve stretches round to the Mull of Galloway. The Isle of Man lies between the two extremities of the gulf thus formed, and marks its western limits. The line of the curve is broken by deep indentations, of which Solway Frith and Morecambe Bay deserve especial notice. A little to the west of the northern entrance to the Menai Strait lies **Great Orme's Head**, a lofty limestone rock, deeply hollowed out into caverns, and connected with the mainland by a low marshy neck. The coast thence stretches

eastward to the estuary of the **Dee**, and is generally low. A large peninsula, rhomboidal in shape, separates this estuary from the mouth of the **Mersey**, on the north-east side of which stands **Liverpool**. A large curve now leads round to the mouth of the **Ribble**. The coast now almost runs due north; and, rounding **Rossal Point**, we enter the spacious inlet called **Morecambe Bay**. To the north-west of this bay lies **Furness district** (p. 125), with the long narrow **Isle of Walney**. Between **Walney** and the mainland are three small islands, on one of which—**Pile Island**—are the ruins of the **Pile of Fouldry**, an ancient religious house. In the roadstead formed by this island and the **Isle of Walney**, vessels find secure shelter during the prevalence of westerly gales. Hitherto the coast has been very low, and, in some places, marshy; but, as the **Cumbrian** group of mountains in some cases comes close down to the shore, we have now rocky cliffs and bold headlands. The direction of the coast is at first north-west, until we round the bold promontory called **St Bee's Head**; it then turns north-east, and the rugged cliffs gradually subside into the marshy tracts that surround **Solway Frith**.

Commencing now with the west coast of **Scotland**, we find the shores of **Dumfriesshire** low and sandy, but further west the coast assumes a rocky character, and is deeply indented by **Wigtown** and **Luce Bays**. We have now arrived at the long narrow peninsula which is terminated on the north by **Corsill Point**, and on the south by the **Mull of Galloway**, the most southerly point in **Scotland**. The coast now sweeps round from **Loch Ryan** to the **Frith of Clyde**. For a part of this distance the shore is bold and precipitous, but as it proceeds northwards it becomes sandy and low.

The whole west coast of **Scotland** forms a large convex curve, broken by two large indentations—the **Frith of Clyde** and **Loch Linnhe**—and by numerous smaller ones. Indeed, in its rocky character, deep inlets, and numerous islands, it very much resembles the coast of **Norway** and

the west coast of Ireland; and, like these coasts, no doubt, owes its stern and rugged character to the strong waves of the Atlantic, and the prevalence of westerly winds. Commencing with the Frith of Clyde, and taking it in its largest sense—that is, as extending from Loch Ryan round to the Mull of Cantire, with many smaller lochs or inlets branching from it—we find, near the estuary of the Clyde, **Gare Loch** and **Loch Long**, the latter communicating with **Loch Goil**. Turning now to the south, and passing the island of **Bute**, we next meet with **Loch Fina**, which stretches far up into the centre of Argyleshire: to the west of this inlet the long peninsula of **Cantire** stretches to the south, and approaches within 14 miles of the coast of Ireland. Across a narrow portion of this peninsula, between **Loch Fina** and the Sound of **Jura**, the **Crinan Canal** has been constructed, and by this means vessels bound for the west coast may avoid the long and dangerous passage round the Mull of Cantire. On the east side of the peninsula, to the south of **Bute**, we have the island of **Arran**, and on the west there are also two islands—**Jura** and **Islay**. From the northern extremity of **Jura** the coast runs towards the north, almost in a straight line, and leads into **Loch Linnhe**, which, taken in connexion with **Loch Eil**, stretches above 30 miles into the mainland, and forms the western extremity of the **Caledonian Canal** (p. 94). At the entrance to **Loch Linnhe** stands the large island of **Mull**. It is basaltic in formation, and mountainous in character; and culminates in a peak called **Ben More**, which has an elevation exceeding 3000 feet. At the south-western extremity of **Mull** is the small island of **Iona**, where many of the former kings of Norway, Ireland, France, and Scotland lie buried. To the north of **Iona** is **Staffa**, celebrated for **Fingal's Cave**. The island of **Staffa** is about a mile and a half in circuit, and is surrounded by basaltic cliffs. The cave is one of the most wonderful natural excavations in the world. Its walls are formed of basaltic columns, and it is about 200 feet long, and about 40 feet wide at its entrance.

Passing through the Sound of Mull, and rounding Ardnamurchan Point, we turn to the north-east, and arrive at Skye. This island, like Mull, is of trap formation, and is covered with mountains. To the west of Skye, and separated from it by the channel called the Minch, is the group of islands known as the Outer Hebrides. Between the island of Skye and Cape Wrath the coast is rugged and barren: it is deeply indented by many large inlets, but none of them are of great importance.

It will thus be seen that upon the whole the west coast of Great Britain is more indented than the east coast, though in both the indentations are numerous and important. As the sea is thus enabled to penetrate far into the land, it has a great influence upon the climate, and contributes to its moist and equable character. The number and excellence of the harbours found in different parts of the coast are also of considerable commercial importance. The total length of the coast-line is about 4500 miles, of which Scotland possesses about 2500 miles.

CHAPTER VI.

IRELAND—ITS SURFACE.—GEOLOGY.—MINERALS.— RIVERS.—LAKES.—COAST LINE.

Ireland is an island lying to the west of Great Britain, and is separated from it by St George's Channel, the Irish Sea, and the North Channel. The narrowest part of St George's Channel is about 47 miles across; the Irish Sea is nowhere less than 55 miles in width; but in the North Channel the Mull of Cantire approaches within 14 miles of the opposite coast of Ireland. Ireland lies between the parallels of $51^{\circ} 26'$ and $55^{\circ} 22'$ north latitude; and between $5^{\circ} 26'$ and $10^{\circ} 29'$ west longitude. It is rhomboidal in shape, and rather compact—its indentations being neither large nor numerous, except on the west coast. Its extreme length, from Fair Head to Mizen

Head, is about 300 miles; its greatest breadth about 180 miles; and its area about 32,500 square miles.

In speaking of the great continents of the world (p. 40) it was remarked that they appear, as regards their internal structure, to be constructed on three different plans. The same remark applies, in some measure, to the three great divisions of the British Islands. In Scotland the chief mountain-ranges, as the Grampians and Lowthers for example, have a general direction from east to west; in England the chief ranges, the Pennine and Cambrian, run north and south; in Ireland, the mountains generally lie round the coast. Thus Scotland presents on a small scale a type of the diversified internal structure of Asia and Europe; England, with its large rivers and spreading plains, resembles America; while Ireland, with its interior plains, extensive bogs, and large lakes, bears some analogy to Africa and Australia. Ireland is then, upon the whole, a flat country, though there are some considerable mountain-groups in the north-west and south. It differs from Scotland in the greater amount of level surface, and from England in the absence of fens and valleys. The various bogs enclosed in the great *Central Plain*, which extends across the country from Dublin to Galway Bay, are included under the general name of the *Bog of Allen*. This bog, though flat, has a mean elevation of 250 feet above sea-level. The mountains of Ireland generally lie round the coast, with their steeper slopes towards the sea. The general direction of their ranges is from east to west; they may be arranged in seven groups, six of which lie round the coast, and one is in the interior. We shall mention these groups in order, beginning at the north.

The **Mourne Mountains** are in the county of Down, and approach close to the coast between Dundrum and Carlingford Bays; the highest summit is **Slieve Donard**, 2796 feet in height. The **Mountains of Antrim** form an extensive plateau, containing summits which in some cases reach 1700 or 1800 feet in elevation. The plateau terminates in bold cliffs near Fair Head. The **Mountains**

of **Donegal**.—This group consists of a high rugged mass, intersected by parallel valleys which have a general direction from north-east to south-west. There are several peaks more than 2000 feet in height; the highest summit is **Mount Errigal**, which rises 2462 feet above the level of the sea. **The Mountains of Mayo**.—This group is divided into two parts by the inlet called Clew Bay. To the north of this bay is the **Nephin Beg** range, with **Mount Nephin**, 2640 feet in height; to the south of the bay are the Connemara mountains, which include several summits exceeding 2000 feet. The peak called **Muilrea** is 2682 feet high; and to the north of it, **Croagh Patrick** exceeds 2000 feet. This latter mountain is rendered famous by a tradition which states that St Patrick, having collected all the venomous reptiles on this mountain, threw them into the sea, and thus freed the country from them. A cairn is erected on the summit in memory of this achievement, and pilgrimages are sometimes made to the spot.

The Kerry Mountains form several parallel ranges which run across the country, and into the adjacent county of Cork. A ridge runs on the south side of the Blackwater for a considerable distance to the west; and on the north side of the river, and parallel with this ridge, are the **Knockmeledown** and **Galtee Mountains**. **Carran Tual** in the group called Macgillicuddy's Reeks, near the celebrated Lakes of Killarney, is the highest summit in Ireland; it attains an elevation of 3404 feet: and **Mount Brandon**, in the peninsula which lies between the estuary of the Shannon and Dingle Bay, is 3120 feet in height. **The Wicklow Mountains** cover an extensive tract, extending for about 60 miles from north to south, with a breadth of about 30 miles; they are distinguished for the romantic beauty of their scenery. The summit of **Lugnaquilla** is 3039 feet above the level of the sea, and is the third in height of the Irish mountains.

Besides these six groups, all of which lie round the coast, there are the **Slieve Bloom Mountains**, which extend in a direction north-east and south-west between

the King's and Queen's counties. They form a watershed between the Shannon and the rivers that flow into Waterford Harbour. **Keeper**, the highest summit, has an elevation of about 2200 feet.

From the position of the mountain-ranges we determine the configuration of the surface. The greater part of the interior of Ireland consists of an extensive plain, stretching from Dublin to Galway Bay, and from the shores of Lough Neagh to the borders of the county of Waterford. In no part, except towards the south, does this plain rise more than 320 feet above the sea, and, as has been before remarked, a great portion of it is covered with bogs. These bogs, or peat mosses, constitute a striking feature in the physical geography of Ireland. They cover almost two-fifths of the entire surface of the island, and are divided into *red* and *black* bogs. The red bogs, which occur generally in the Central Plain, produce an abundance of peat; the black bogs generally occur in mountainous districts. "Unlike the English mosses, these are rarely level, but undulating; and in Donegal there is a bog completely diversified with hill and dale. These bogs consist of moist vegetable matter, containing a great deal of stagnant water; and after heavy rains, fogs, etc., sometimes burst, and inundate or overwhelm the surrounding country. But they vary infinitely in wetness, as also in depth and composition. The bogs in general rest upon a stratum of blue clay, based on limestone, and are invariably above the level of the sea."—(*M'Culloch: Dictionary of Geography.*)

Six-sevenths of the flat red bogs of Ireland would be included in two lines drawn, one from Howth Head to Sligo, and the other from Wicklow Head to Galway; and of the bog-land thus included, more than two-thirds lie west of the river Shannon. It is generally thought that these mosses might be drained at a little expense, but whether the land when drained would be fit for agriculture is a matter of dispute. At present the bogs are of considerable service in supplying abundance of peat, which,

in the absence of timber and the scarcity of coal, is the principal fuel of the great mass of the people.

The geological systems found in Ireland belong principally to the Primary formation; small patches of the Secondary and Tertiary formations occur to the south of Lough Neagh, and in the bed of the river Lagan. In Donegal, Mayo, and Galway, Metamorphic rocks are found: in the neighbourhood of the Kerry, Wicklow, and Mourne mountains, the Silurian system prevails; while the plateau of Antrim is an immense field of trap or basalt, forming, indeed, the largest basaltic formation in Europe. It extends over an area of 8000 square miles, and in the Giant's Causeway presents a magnificent specimen of columnar basalt.

The interior of Ireland is almost entirely Carboniferous, but the coal-measures are not developed to such an extent as in England, and the rocks consist principally of mountain limestone. The Slieve Bloom mountains, and the ranges lying to the south of them are principally of Old Red Sandstone, and in various places in the Great Central plain the Old Red bursts through the mountain limestone. The coal-fields, as we have already indicated, are few and unimportant; the principal one is in the county of Kilkenney, where the coal is of the kind called *Anthracite*. It burns without flame or smoke, and yields a great heat; but its sulphurous exhalations unfit it for domestic purposes. The best coal of an ordinary kind is found in the neighbourhood of Dungannon, to the west of Lough Neagh. Other coal-fields occur in the counties of Leitrim, Monaghan, Tipperary, Limerick, Cork, and Kerry. *Iron-ore* is found diffused pretty widely, but the absence of coal prevents its being worked. It is said that iron-works were at one time much more numerous in Ireland than they are at present; and that it was owing to the quantity of wood consumed in these works that the forests, which were once so numerous in Ireland, were cut down and destroyed; this is said to have taken place early in the 17th century. This supply of fuel, however, becoming exhausted,

the iron-works were abandoned. *Copper, lead, and silver*, are found in Cork, Kerry, and Wicklow, and in the latter county small quantities of gold have been discovered. *Granite* is abundant in Donegal, and Galway; beautiful statuary *marble* is found also in the same counties, and the black and grey marbles of Kilkenny are exported to a considerable extent. On the southern and western shores of Lough Neagh is an extensive deposit of clay, which is found in small quantities in some other places in Ireland.

Rivers.—Unlike the rivers of Scotland, the rivers of Ireland flow for most part of their courses through a flat country, and hence their currents are slow, and their courses are not often interrupted by rapids or waterfalls. Owing to this character they may want the picturesque scenery of Scottish rivers, but they are of greater commercial importance, and many of them, at the expense of a very little labour and capital, might be made navigable almost to their sources. The principal rivers of Ireland, commencing with the Shannon and going round by the south coast, are the Shannon, Bandon, Lee, Blackwater, Suir, Nore, Barrow, Slaney, Liffey, Boyne, Bann, Foyle, and Erne.

The **Shannon** rises in the county of Cavan, about 345 feet above the level of the sea, and, after running a few miles, flows into **Lough Allen**. Leaving this lake it flows southward, and soon afterwards enters **Lough Ree**,—a large irregular sheet of water about 17 miles in length. Issuing from Lough Ree, the river passes Athlone, and at Shannon bridge is joined by its principal feeder, the **Suck**. This feeder rises in Roscommon, and, flowing south-east, separates the counties of Roscommon and Galway, and joins the Shannon on the right bank. After receiving the Suck, the Shannon winds its way past Banagher, and then flows into **Loch Derg**. This lake is 23 miles long, and its shores are indented with numerous bays and inlets. On the southern shore it is bordered by a ridge of high mountains, connected with the chain of Slieve Bloom (p. 147).

After leaving this lake, the river curves round to Limerick, and then expands into a broad estuary varying in breadth from one to eleven miles. A few miles above Limerick are the *Rapids of Doonas*, and here, and in some other parts of the river, short artificial cuts are made to avoid the rapids.

The total length of the Shannon, from its source to the sea, is about 224 miles, and its basin occupies an area of almost 7000 square miles. It has sometimes been compared to the Severn. Both rivers are about the same in length, and flow in a similar direction; both are navigable throughout the greater part of their courses, though the navigation is obstructed in some places by shallows and rapids; and both rivers expand into broad estuaries.

The importance of the Shannon as a commercial river is considerably increased by its connexion with the Grand and Royal Canals, which run from Dublin and join the Shannon—the former between Shannon Bridge and Banagher, the latter at Longford.

The Blackwater.—This river rises on the borders of Limerick and Kerry, and flows at first almost due south; it then takes an easterly direction and flows across the county of Cork, and into Waterford. During this part of its course it receives many feeders, among which may be mentioned the *Awbeg*, immortalized by Spenser under the poetical name of Mulla,—

“ Amongst the coolly shade
Of the green alders, by the Mulla's shore.”

At Cappoquin the Blackwater turns suddenly to the south, and, being augmented by the water of the *Bride*, flows into Youghal Bay. It is about 100 miles in length, is rather rapid in its course, and is very subject to floods. There is a bar across its mouth, and this, combined with the proximity of the good harbours of Cork and Waterford, prevents it from becoming of much commercial importance.

The Suir rises in the Slieve Bloom mountains and flows southward through Tipperary until it comes into the

neighbourhood of the Knockmeledown mountains (p. 147). It then flows for a short distance eastward, and then flowing northward for some distance, again bends to the east, and passing Carrick, flows south-east, and a little below Waterford expands into an important estuary. Vessels of 800 tons burden can reach Waterford, which is 15 miles from the sea, and for small barges the river is navigable to Clonmel—a distance of 40 miles.

The Barrow rises in the northern extremity of the Slieve Bloom mountains, and flows at first to the north-east, then turning southward it is joined by the Nore, and empties itself into Waterford Harbour. The Barrow is navigable to Athy, a distance of 60 miles from the sea, and at this place it is joined by a branch of the Grand Canal; so that it has water communication with Dublin. The **Nore** rises near the source of the Suir, and flowing southward through the county of Kilkenny, joins the Barrow on its right bank, near New Ross. The basin of these three rivers, the Suir, Barrow, and Nore, embraces an area of about 3400 miles.

The Boyne rises in the *Bog of Allen* (p. 146) in Kildare, at an altitude of 224 feet. Its course is at first north-east past Trim, and at Navan it receives an important feeder—the **Blackwater**. This stream has its source in *Lough Ramor*, in the county of Cavan, and flowing to the south-east, joins the Boyne on its left bank. The river now flows eastward, and at Drogheda expands into an estuary about two miles in length.

The Bann consists of two parts, the Upper and Lower Bann. The Upper Bann rises in the plain called the King's Meadow, in the northern part of the Mourne mountains (p. 146), and, flowing in a general direction to the north-west, flows into Lough Neagh at Bannfoot Ferry.

Lough Neagh is one of the largest lakes in Europe; it is 20 miles in length by about 10 in breadth, and has an area of about 150 square miles. Its shores are low, and in some places marshy, and it is almost destitute of islands.

It is only about 40 feet above sea-level, and its average depth is about 50 feet. It is fed by several considerable streams besides the Upper Bann, but the Lower Bann is its only outlet. Its waters are celebrated for their petrifying property.

The Lower Bann issues from the north-west arm of the lake, and flows into the sea about five miles below Coleraine. The current is rapid, and in some places the water is precipitated over ledges of rock; hence the river is not navigable above Coleraine. The salmon and eel fisheries on this river are very important. Including both its upper and lower divisions, the total length of the Bann is about 100 miles.

The Erne has its rise in *Lough Gounagh*, in the county of Longford. It then flows northward through the county of Cavan, and after passing through *Lough Oughter*, enters the upper Lake Erne. On issuing from this lake it flows north-west, and enters the second and larger lake. Both these lakes are full of islands, and remarkable for their beautiful scenery. Many of the islands are well-wooded, and some are thickly populated. The town of Enniskillen stands on an island in the river between the two lakes, and is connected with the mainland by bridges on either side. The lower lake is discharged by a rapid current about nine miles in length, which, after forming many rapids, precipitates its waters down a magnificent cascade into the sea at Ballyshannon.

Lakes.—The lakes of Ireland are far more numerous than those of England, but less so than those of Scotland. Some of these have already been mentioned in connexion with the rivers. Of the remainder the principal are the Lakes of Killarney, and Loughs Corrib, Mask, Conn, and Derg.

The Lakes of Killarney.—These lakes lie in the bosom of the Kerry mountains (p. 147), and are three in number, but connected together by the *river Lane*. The lower lake is the largest, and is about five miles in width; its western shore is skirted by mountains exceeding 2000

feet in elevation, their precipitous sides being clothed with forest trees. On the eastern shore there is a level tract of rich and well cultivated land. There are above thirty islands on this lake, many of them extremely picturesque. The middle lake is the smallest of the three, and is connected with the upper lake by a beautiful channel three miles in length. The upper lake lies in a hollow surrounded by some of the loftiest summits in Ireland, among which may be mentioned Mangerton and Carran Tual. Here the scenery is grand and sublime. It is the contrast between the sublimity of the upper lake and the softer beauties of the middle and lower lakes which constitutes the charm of this neighbourhood.

Lough Corrib.—This lake is said to resemble Lough Erne in some respects. It is about 24 miles long, and 14 in its widest part, but is contracted in the middle by a narrow channel. Its waters are discharged into Galway Bay by the river Corrib—a stream about five miles in length. The country on the south and west sides of the lake is wild, rugged, and mountainous; but on the north and east it is comparatively level and fertile.

Lough Mask is a large lake, about three miles to the north of Lough Corrib, and is said to be joined to it by a subterranean channel. **Lough Conn** lies in the northern part of the county of Mayo, to the east of Mount Nephin. **Lough Derg** is the name given to two lakes in Ireland—one in the basin of the Shannon, and the other in the southern part of Donegal. The latter is a small lake situated in a hilly district, at a considerable elevation above the sea. Upon a small island in this lake is a cave called *St Patrick's Purgatory*, which is at present annually visited by crowds of pilgrims from among the Roman-catholic population of Ireland.

Coast Line.—Commencing on the north-east, we find the shores of Antrim bold and precipitous, consisting in many places of vast masses of basaltic columns. **Fair Head** rises about 600 feet in height, and consists of cliffs of hard grey rock, with scarcely a mark of vegetation

upon them. To the north-west of this cape is **Rathlin Isle**, with its steep and rocky shores. In the strait which separates this island from the mainland, the phenomenon of the mirage, similar to the *fata Morgana* between the coasts of Sicily and Italy, is often observed. To the west of Fair Head is **Bengore Head**, which is made up of a number of peaks, some of which exceed 300 feet in elevation, and display great elegance and regularity in their columnar arrangement. But all these basaltic cliffs are thrown into the shade by the **Giant's Causeway**, which lies still further to the west. This is an extensive assemblage of basaltic columns, consisting of three piers or causeways—the eastern, middle, and western. These piers are composed of a multitude of pillars, varying in height from 15 to 36 feet, with a diameter of from 15 to 28 inches. The pillars have from three to nine sides, but the greater number are pentagons and hexagons. At Fair Head and Bengore Head the columns are higher, but the angles are not so sharp, and the pillars are of a coarser texture. The basalt of which they are composed is of a very dark colour, approaching to black.

The coast to the west of Giant's Causeway preserves its bold and rocky character to the mouth of the Bann, when the shore becomes low, and continues so as far as the bold headland of **Magillan**, which stands at the entrance of **Lough Foyle**. This lough forms an immense oval basin, about 16 miles long, and from 9 to 10 broad; but at its entrance it is contracted to less than a mile in width. The lough is a good deal encumbered with shoals, and navigation is rather difficult. Leaving **Lough Foyle**, and turning to the north-west, we round **Malin Head**, the most northern point in Ireland, and turning south-west, we enter **Lough Swilly**. This large basin extends about 25 miles inland, and possesses deep water and good anchorage; but as there is no place of importance on its shores, it is seldom visited by ships. There is no other inlet of any importance along the coast of Donegal, and the shores are in general mountainous, wild, and

dreary. On the south-west the country terminates in a peninsula, which extends inland from **Rossan Point**—a distance of about 15 miles. Here is the wildest and most romantic scenery, and in some places the coast is lined with magnificent cliffs 2000 feet in height.

Passing **Donegal Bay** and **Sligo Bay**, the coast next trends westward to **Erris Head**. In this part of the coast there is no harbour of consequence except Killala and Broadhaven. Erris Head is the northern extremity of a curiously shaped peninsula called the **Mullet**, between which and the mainland is **Blacksod Bay**. To the south of this bay is **Achil Island**, separated from the shore by a narrow shallow strait. This island,—sometimes called Eagle Isle, from its being the resort of eagles,—is 17 miles long and five broad. It is inhabited by a population of about 6000, who are occupied chiefly in fishing, and in tilling small patches of land.

Clew Bay, to the south of Achil Island, is protected seaward by **Clare Island**. The coast of Galway is extremely rugged, and deeply indented. **Galway Bay** is protected by a natural breakwater, formed by the **Arran Isles**, which extend about a dozen miles across its mouth, leaving two entrances, one to the north and the other to the south of the islands. The former is somewhat dangerous, owing to rocks and shoals, but the latter is open and safe. The coast now trends south-west to **Loop Head**, and is destitute of any safe harbour. The estuary of the Shannon, lying between Loop Head and **Kerry Head**, forms one of the largest and safest harbours on the Irish coast. The coast of Kerry is deeply indented, and in several parts extremely rugged. The peninsula of Dingle, lying between the Tralee and Dingle Bays, is full of mountains, among which Mount Brandon is a noted landmark. **Dunmore Head** is the western extremity of this peninsula, and is also the most western point in Ireland. On the south side of Dingle Bay is **Valentia Island**; it has an area of about 40 miles, and is very fertile. The harbour, formed by the island and the chan-

nels separating it from the mainland, is deep and capacious, and forms one terminus of the Atlantic cable which connects Europe with America (p. 43).

Leaving Valentia Island and passing **Kenmare River**, we next come to **Bantry Bay**. This large harbour, remarkable alike for its natural beauties and natural advantages, lies between two headlands, known respectively as **Crow Head** and **Sheep's Head**. It extends inwards nearly 30 miles, with a breadth varying from four to six miles. The water is deep, unencumbered with shoals, and there is a good anchorage ground. Now rounding **Mizen Head**, the most southern point in Ireland, we next come to **Cape Clear**. This bold headland is at the southern extremity of Clear Island: it is 400 feet high, and has been surmounted by a lighthouse which exhibits a bright revolving light. Ships bound westward usually take their departure from this point.

From Cape Clear the whole southern coast of Ireland stretches in a general direction to the north-east, and the shores, though not so broken and rugged as on the west, yet are rocky and indented. The principal inlet is **Cork Harbour**. The entrance to this is by a deep channel, two miles long and one broad, defended on each side by forts. Within, the harbour spreads out into a magnificent basin, interspersed with several islands, the largest of which is Great Island, on which stands Queenstown. From Cork harbour the shore trends north-east to **Youghal Harbour**, in the vicinity of which the sea appears to have gained on the land, as the beach at low water consists of a bog covered with sand, under which are found the remains of trees. The coast of Waterford is rocky throughout, and has some considerable indentations; **Dungarvon Harbour** is only indifferent, and **Tramore Bay** is the most dangerous place on the Irish coast; but **Waterford Harbour** is deep and capacious. The coast eastward to **Carnsore Point** is destitute of good harbours, and is skirted by dangerous rocks and islands. About seven miles to the north-east is **Tuscar Rock**, upon which

a lighthouse, modelled after that at Eddystone, has been erected.

The east coast of Ireland stretches in a curve from Carnsore Point to **Dundalk Bay**; another smaller curve leads from Dundalk Bay to Fair Head. The shores are in general low and flat, and lined with sandbanks and sunken rocks. **Wexford Haven** is spacious but shallow, and its entrance is rendered inconvenient by a bar of shifting sand. From thence to Dublin Bay there is not even a tolerable port. Dublin Bay is about six miles wide at its entrance. Its southern shore is backed by the mountains of Wicklow; but its northern shore is low and level, except in the neighbourhood of **Howth Head**. The bay is exposed to the east winds, and there is a bar at its entrance; so that it forms but a very indifferent harbour. There is a submarine telegraph between Howth Head and Holyhead. **Dundalk Bay** is extensive, but shallow, and mostly dries at low water. It contains extensive oyster-beds. The shores a little to the north of Dundalk Bay are bold and precipitous, as the Mourne Mountains come close down to the water's edge. **Strangford Lough** is the best harbour on the east coast. It is entered by a channel six miles long, and not quite a mile broad, and then expands into a large basin, extending north for about 15 miles, with a breadth of five or six miles. The entrance is rather difficult, owing to the rapidity of the tides, and to sunken rocks; but within there is a great depth, with good anchorage and secure shelter. From Strangford Lough the coast curves round to **Belfast Lough**, and we again return to the shores of Antrim.

CHAPTER VII.

CLIMATE OF THE BRITISH ISLANDS.—VEGETABLE PRODUCTIONS.—ANIMAL PRODUCTIONS.—FISHERIES.

In a former chapter (Part I. chap. x.) we have spoken generally of the distribution of climate over the globe, and of the causes on which it depends and by which it is modified. In this chapter we shall speak more particularly of the climate of the British Islands. Great Britain and Ireland are situated almost in the centre of the temperate zone, but their climate is warmer than that of most countries under the same parallels. The surface of the islands is not greatly elevated, and, with the exception of some summits in Scotland, the mountains never exceed 4000 feet in height, while the general elevation of the plains is scarcely 400 feet. The soil, of England especially, is well drained, and nowhere are there large forests to absorb the rays of the sun and to lower the temperature. On the other hand, the neighbourhood of the Gulf Stream tends to raise the temperature. We have already seen (p. 60) that a branch of this current washes the western shores of the British Islands, and it has been found that the water on the west side of Great Britain has a much higher temperature than the waters of the German Ocean. In the Irish Sea, even in January, the temperature is seldom below 50° ; in the Atlantic it is still warmer; while the temperature of the German Ocean is seldom above 45° .

Winds raise or lower the temperature according to the quarter from which they blow (p. 71). In Great Britain east winds prevail generally from January to May, while west winds blow from June to December. The west winds are the *return* winds from the equator, and these depend upon the movement of the "Calm belts." From May to September the Calm belts move northward, and southward between September and May (p. 49). To this

we must add the fact that in winter water has a higher temperature than land (p. 73). Hence, in winter and spring, currents of cold air rush from the continent of Europe, across the British Islands, towards the Atlantic; but gradually, as the seasons advance, the continental lands become heated, and there commences a rush of cold air from the Atlantic eastward. In Great Britain the westerly winds exceed the easterly in the proportion of 225 to 140; while in Ireland the west winds prevail for three-quarters of the year.

Having made these general remarks, we may now consider the climate of the British Islands more in detail, and in doing so we shall characterize it as mild, equable, humid, variable, and healthy.

Mild.—We have already seen that the isotherm of 50° passes through Dublin and London (p. 73), and this may be looked upon as the mean annual temperature of England and Ireland. In Scotland, owing to its greater distance from the equator, the annual temperature is not so high, but the difference is not very great, as, owing to its indented shores, it is open to the tempering influence of the surrounding ocean. The mean annual temperature of Ireland is perhaps a little higher than that of England, owing to the mildness of its winters. The temperature in the British Islands in the month of July ranges from 53° to 64°, while in January it ranges from 33° to 43°. The lowest winter temperature is found along the east coast of Great Britain, from the Naze, in Essex, to the Frith of Forth, where it averages 35° or 36°. The highest average summer temperature is experienced in the south and south-west parts of England, where it is about 64°.

Equable.—It has been before mentioned (p. 73) that climates have been classified according to the amount of difference between the mean summer and mean winter temperatures. In the British Islands the difference is less than 30°, and therefore the climate is *insular*. The equability of the climate is owing in a great measure to the presence of large bodies of water, and to the conse-

quently mild winters. For it has been noticed, as a remarkable fact, that the extremes of heat upon the earth's surface differ much less than the extremes of cold. Thus Great Britain has almost the same mean summer temperature as Yakutsk, which is situated in the coldest habitable part of the globe (p. 69); yet its winters are as mild as those of Venice, Constantinople, and Nankin. The difference between the mean summer and mean winter temperatures of London is 25° , at York it is 30° , at Edinburgh 21° , at Dublin 22° , and at Penzance only about 16° . At Venice the difference is 40° , and at Yakutsk it exceeds 100° .

Humid.—The west winds are the *rain* winds of temperate regions (p. 55); hence, as these winds prevail to a considerable extent in the British Islands, we should expect the climate to be very humid. But the east winds also become laden with moisture as they sweep across the German Ocean, and thus they also often bring rain. Besides, the air itself, even when in a state of rest, is always laden with vapour derived from the surrounding seas, and hence that verdant appearance presented by the British Islands, even in summer, and more especially in Ireland—the “Emerald isle.” The mean quantity of rain received during a year by the temperate regions of the Old World is 34 inches, but in the latitude of Great Britain the quantity is much less. At Paris about 22 inches fall annually, at Berlin 20 inches, and the quantity decreases as we advance eastward. On the east coasts of England and Scotland from 20 to 30 inches fall; on the west coasts from 30 to 40 inches; while in Ireland the average quantity ranges between 40 and 50 inches. Of course in some places, owing to local causes, the amount is far greater. At Greenock, and round the mouth of the Clyde, 50 inches fall annually; at Keswick the fall is said to be 70 inches; while Seathwaite—the wettest place in Europe—receives annually 146 inches. Not only does the annual quantity of rain increase as we move westward from the east coast of Great Britain, but so also does the

number of rainy days. On the east coast there are about 150 rainy days in a year, on the west coast about 170, and in the neighbourhood of the Cumbrian mountains 180. Ireland has a greater number of wet days than any other country in Europe. The average number of days during which rain falls in that country is 208. In concluding this part of our subject we may remark that on the east coast of England summer and autumn rains prevail, while the prevailing rains of Ireland are autumn and winter rains.

Variable.—Though the east winds prevail generally during the first half of the year, and the west winds from June to December, yet very often, in the course of a single day, the wind will veer round, and blow successively from every point in the compass, and thus cause frequent and sudden changes in the temperature: this is especially the case in the months of spring and early summer. But though the changes are frequent, they are not great when compared with those of continental countries. The average mean daily range for London is 11° , in the midland counties it is a little higher, but in Cornwall it is only 8° . At Rome it is about the same as at London, at Montpelier it is 12° , and at Naples 13° . These sudden changes are not injurious to the human constitution, but rather tend to harden it; and as, owing to their frequency, the husbandman must exercise prudence and foresight in taking care of his produce, they become, indirectly, a means of strengthening his intellectual faculties.

Healthy.—Little remains to be said under this head. A temperate climate is generally acknowledged to be most beneficial to man physically and mentally. Excessive heat enfeebles him, and the mind suffers; excessive cold hurts the body, and all the powers of the mind are directed to supply bodily wants. In such a climate as that of Great Britain there is an abundance of vegetation, and hence a supply of animal food, without which, it is generally admitted, the highest faculties of the mind cannot be fully developed. A moderate quantity of moisture in the

atmosphere is conducive to health, and hence Scotland is still more healthy than England. And Ireland is scarcely less healthy: fevers and dysentery are more prevalent than in Great Britain, but this may be as much owing to want of proper food and lodging as to the humidity of the air or the exhalations from the bogs.

"Among those who have formed a correct estimate of our climate is Sir William Temple. 'I must needs,' says he, 'add one thing more in favour of our climate, which I heard the king say and I thought new and right, and truly like a king of England that loved and esteemed his own country, it was in reply to some of the company that were reviling our climate and extolling those of Italy and Spain, or at least of France. He said he thought that was the best climate where he could be abroad in the air with pleasure, or at least without trouble and inconvenience, the most days of the year and the most hours of the day; and this he thought he could be in England more than any other country in Europe.'"—[*McCulloch: British Empire.*]

Vegetable Productions.—England and Ireland were formerly covered with immense forests. In England a large forest extended from the banks of the Thames northward beyond the Trent, and through the Great York plain almost to the borders of Scotland. Another embraced the district of the Weald, and extended into the neighbouring counties of Surrey and Hampshire. But these have almost entirely disappeared through the progress of agriculture, and only here and there do we find some smaller forests preserved for the growth of the oak, so necessary to our navy. Among those still remaining may be mentioned *New Forest* in Hampshire, *Dean Forest* in Gloucester, *Windsor Forest* in Berkshire, and *Sherwood Forest*, renowned through the exploits of Robin Hood, in Nottingham. In Ireland the disappearance of the forests is said to have been caused by the immense quantity of timber consumed as fuel in the seventeenth century, especially in connexion with the large iron-works then existing (p. 149). Scotland has always been thinly wooded; but

there are some considerable fir plantations in the Highlands, especially in the county of Aberdeen.

Notwithstanding the absence of large forests, however, the British Islands, and England in particular, must be considered as well-wooded, when we take into account the thick hedge-rows, and small copses and plantations everywhere met with. Here we find the oak, elm, birch, alder, hazel, yew, and ash; with their humble companions the hawthorn, holly, briar, and bramble. In Scotland the principal trees are the birch, alder, poplar, and mountain-ash; in the southern parts of England the maple, beech, Spanish chestnut, and mistletoe are found. Ireland, owing to its mild winters, has some plants which are elsewhere found only in the south of Europe; among these may be mentioned the arbutus tree, with its bright evergreen foliage and rich red berries. This, as well as the broad-leaved myrtle, is found in the southern counties; and yet the heat of summer is not sufficient to ripen properly plums, pears, and peaches, which come to great perfection in England. On the coasts of Cornwall, also, the myrtle, laurel, and camelia are green through the whole year. In the north of Scotland black swamps and dreary mosses cover a great portion of the surface; but in England there are few barren spots, and the county of Surrey is said, for its size, to contain more heaths and sandy commons than any other part.

Animal Productions.—In countries so abundant in vegetation as Great Britain and Ireland, we should expect animals to be numerous. We still find numerous hedge-rows which afford shelter to birds and insects, and we have seen that at one time there were extensive forests to offer a retreat to larger animals. These have, for the most part, disappeared before the progress of civilisation, and the Fox is now, perhaps, the largest of our wild animals; but at one time our islands supported the bear, wolf, wild boar, wild ox, wild cat, and beaver. There is proof that Bears infested Scotland so late as 1057, when a Gordon was directed by the King to carry three bears'

heads upon his banner, in reward for having killed a fierce bear. So numerous were **Wolves** in England, and so savage during the winter, that our Saxon ancestors called January the *wolf* month. The last wolf was killed in Scotland in 1680; but in Ireland they continued to infest the country so late as 1710. **Wild boars** were the favourite animals of chase among our ancestors; they were extirpated about the time of the civil war. In the reign of Henry II., **Wild oxen** (*Uri Silvestres*) are mentioned as inhabiting the large forests in the neighbourhood of London. Long before the Reformation, however, they seem to have been confined to parks. A few are still preserved in the park belonging to Chillingham Castle, near Berwick-upon-Tweed: they are white in colour, with black muzzles, and the tips of their ears and horns are black. There is also a breed, not perfectly white, in the Duke of Hamilton's park, in Lanarkshire. **Wild cats** are even yet occasionally met with; **Beavers** have long since become extinct, and seem, at all times, to have been very scarce.

The principal wild animals, at present existing in the British Islands, are the fox, badger, otter, squirrel, weasel, and hedgehog. The red deer or stag is found in the Highlands of Scotland, and in some parts of England and Ireland; the roebuck is abundant in the north of Scotland; and the wild goat is occasionally met with in the mountains of Wales. Among birds we may mention the **Ptarmigan**, which is found in the wildest parts of Scotland, and in the Hebrides and Orkney islands; the **Red grouse**, which is peculiar to the British Islands; the **Great bustard**, now almost confined to the county of Norfolk; and the **Eagle**, chiefly found in the north of Scotland. No snakes are found in Ireland, nor indeed is any venomous reptile. The domestic animals of the British Islands are too well known to require particular mention.

Fisheries.—The fisheries of Great Britain are very important. The **Herring** fishery is prosecuted on various parts of the coast, but especially in Loch Fine (p. 144),

and in the neighbourhood of Yarmouth. Cod is taken on the coast of Yorkshire. The Pilchard fishery gives employment for 8000 or 9000 people, on the shores of Devon and Cornwall. The coast of Essex is celebrated for its **Oyster-beds**, and the coast of Suffolk for its **Turbots**. The shores of Ireland also abound in fish, but the fisheries are not very flourishing.

CHAPTER VIII.

PROGRESS OF CIVILISATION IN THE BRITISH ISLANDS.—
 ANCIENT BRITAIN.—FUSION OF RACES.—SPIRIT OF CON-
 QUEST.—SPIRIT OF COMMERCE.—PRESENT POLITICAL
 CONDITION.

In the present chapter we shall give a brief sketch of the progress of civilisation in the British Islands; and in doing so shall endeavour to trace the gradual changes which have taken place since Great Britain was a wild, uncultivated island, inhabited by wild beasts, and by a race of men scarcely less savage. Such a sketch, we think, will not be an unfitting introduction to the succeeding chapters, in which is given an account of the present political and commercial condition of Great Britain and Ireland.

About two thousand years ago, Great Britain was a wild, uncultivated island, covered with swamps and forests. Speaking generally, we may say that all the hill-ranges, with the exception of the Grampians, Lowthers, and Cambrian mountains, were thickly wooded. A large forest lay to the north of Glenmore and stretched to the borders of the county of Caithness: another covered the valley of the Spey and the Monadh Leadh mountains, and remnants of this may, perhaps, still be seen in the forests of Abernethy and Kingussie. The Sidlaw and Ochill hills were also well wooded, as were the Cheviots. In England

the Pennine chain and its various offshoots, the Cumbrian mountains, and the moors and wolds of Yorkshire, were covered with forest; and many tracts in this, as in other parts of the island still bear the name of *forest*, though now almost destitute of trees. We have already mentioned the large forest stretching from the Trent to the Thames: Epping forest was then of much larger extent than now, and Delamere forest, Cheshire, is only the small remnant of a large and well-wooded district. The various hills in the basin of the Severn,—the Wrekin, the Clent, and Clee hills, the Cotswolds, and Dean forest were covered with trees. A large belt of forest land stretched from the Weald to the Bristol Channel; and, finally, the names “Exmoor forest” and “Dartmoor forest” show that these tracts were formerly well-wooded. Ireland seems to have been destitute of large forests, but still it would seem to have had abundance of wood; and it was the enormous quantity of timber consumed in its iron-works that caused its present deficiency.

Swamps and marshes were in the same districts in which we now find them, but were of much larger extent; and on the coast of Lancashire and round the Wash (p. 137) were considerable wastes. Wild oxen, boars, wolves, and wild cats roamed in the extensive forests, and beavers and otters had their dwellings in our rivers and streams.

The original inhabitants of the British Islands belonged to the Celtic race (p. 87), and of this race there seem to have been two branches. The first settlers were *Gaels*, perhaps so called because they came over from Gaul; and they were succeeded by the *Cimbri*. Afterwards a portion of the Gaelic population seems to have passed over into Ireland, and the Cimbric branch obtained the ascendancy in Great Britain. Subsequently the *Belgæ*, a Gothic or Teutonic tribe (p. 87), settled in the south-west parts of Britain; and the *Scots*, another colony of Goths, settled in Ireland. It is also supposed that Gothic tribes settled in Scotland among the Celtic population, for Tacitus mentions that the Caledonians were of German

descent. In the fourth century the Caledonians began to be known as *Picts*, and these, we have already said, are supposed to have been a Gothic tribe (p. 88). The *Belgæ*, at the time of Cæsar's invasion (B.C. 55), would seem to have been the most civilized of all the inhabitants of Britain. They understood something of agriculture, wore a long garment as clothing, lived in wooden houses, and kept up some intercourse with Gaul. In the interior of the island, however, the Celtic population followed the occupation of shepherds, or depended for subsistence on the chase. The skins of animals formed their only covering, their half-naked bodies were tattooed and stained with a plant called *woad*, and the people dwelt in miserable clay huts. Unlike the present inhabitants of Britain, the ancient Britons disliked the sea; they never tasted fish, and were not allowed to eat the hen, the hare, or the goose. In times of scarcity, even then, the scanty population would be reduced by famine, and on the testimony of St Jerome we learn that cannibalism prevailed.

The Britons seem to have been skilled in some arts, as is shown by the war-chariots, and the boats made of basket-work, which were similar to the *coracles* still used in Wales. Their religion, as is well known, was a cruel superstition in which human sacrifices were required. In government the various tribes seem to have been independent; but in times of war they united together for the general safety, and fought under a common leader.

Julius Cæsar, after subduing Gaul, turned his attention to the island of Britain. Twice he invaded the country; but he only succeeded in penetrating to the capital of the British leader, Cassivellaunus, which is supposed to have been situated near the site of St Alban's, and having demanded hostages and imposed a tribute, returned to Gaul. Succeeding generals extended the Roman conquests until Agricola penetrated the region beyond the Clyde and Forth, reached the foot of the Grampians, and gained a great victory over the Caledonian leader, Galgacus (A.D. 84).

After the victory, Agricola sent his fleet, which attended upon the army, and was now in the Frith of Tay, on a voyage of discovery. It sailed northward, rounded Dunnet Head and Cape Wrath, proceeded down the western coast of Great Britain to Land's End; then turning up the Channel, arrived safely at the Trutulensian harbour—supposed to be Sandwich—and, continuing northward, finally returned to the place from which it set out. To protect the southern parts of Britain from the incursions of the northern barbarians, Agricola erected **two lines of forts**,—one from the Frith of Forth to the Frith of Clyde, and another from the Solway Frith to the German Ocean. The Emperor Hadrian erected a rampart along this second line for the purpose of strengthening it; and in the succeeding reign, another rampart, consisting of an earthen wall and a deep ditch, was constructed along the former line, from Carriden on the Forth to Dunglas on the Clyde. But these defences were unable to resist the attacks of the northern hordes, and the Emperor Severus, in his old age (A.D. 207), determined to strike terror into the savage Caledonians. He advanced even farther than Agricola, and is supposed to have reached the neighbourhood of Cromarty Frith. Yet, although the natives sought and obtained peace, he seemed to think it useless attempting to preserve his conquests north of the Tyne; he, therefore, contented himself with erecting a strong wall of stone along the rampart of Hadrian and the forts of Agricola, defended the wall with stations, castles, and towers, and dug a deep ditch, on its northern side, about 36 feet in width.

Nor were these walls and ramparts the only means taken for securing the conquest of the island. Fortified *castra* or camps were established in different parts of the island, and the positions of many are still preserved in the termination *Chester* which we see compounded with many names of towns. Roman roads, also, commonly known as *streets*, intersected the country in all directions, among which the principal were Ermine Street, Watling

Street, and Fosse Way. **Ermine Street** commenced at London, and went almost due north, through Lincoln, to a point on the Humber. **Watling Street** commenced at Richborough, on the shores of Kent, passed through London, and was continued north-west. It crossed the Great Ouse, Warwickshire Avon, and Tame (p. 120), and then turned almost due west to Wroxeter, on the Severn. From Wroxeter it proceeded northward, probably to Chester, where one branch is supposed to have turned off towards the Isle of Anglesey. From Chester it proceeded through York to Catterick Bridge, and soon after divided. One branch passed through the county of Durham, crossed the Tyne, and, continuing in a north-easterly direction, terminated on the shores of the Frith of Forth. The other branch passed through Carlisle, and reached the Frith of Clyde, in the vicinity of Glasgow. **Fosse Way** coincided almost with the line we indicated as dividing the Central District into two parts. It passed from Lincoln, through Leicester and Bath, to the shores of the English Channel.

The Romans held possession of Britain for about 400 years, and during this time civilisation made rapid progress. Agriculture became general and was much improved, so that the island was enabled to export corn. Horticulture was practised and fruit trees introduced from the east. The mineral treasures of the country—tin, copper, and lead—became known, and its pearls and oysters were valued. Flourishing towns sprang up in various parts. The inhabitants adopted the dress and manners of their Roman conquerors, and imitated their vices as well as refinements. At length Rome was obliged to withdraw her legions from the shores of Britain in order to defend Italy against the armies of the Goths. The Britons, enervated by a long peace, were unable to protect themselves from their northern invaders. The Scots had emigrated from Ireland, or Erin, to the southern parts of Caledonia, and, mingling with the inhabitants at this time known as Picts, burst through the wall of Severus, and

laid waste the northern parts of south Britain. In this extremity the Britons sought help from the Saxons—a warlike nation inhabiting the peninsula portion of Denmark, and the country between the Elbe and the Weser.

The term “Saxons” was a general name for at least three tribes belonging to the Teutonic branch of the Caucasian type (p. 87),—these were the Jutes, who inhabited that portion of Denmark now called Jutland; the Angles, who dwelt in the southern part of that peninsula; and the Saxons, who dwelt between the lower courses of the Elbe and the Rhine. They were brave in arms, and passionately fond of the sea; but rude and barbarous, and the followers of a pagan faith. The Jutes were the first to respond to the call of the Britons, and under their leaders, Hengist and Horsa, a party of them landed on the shores of Britain about A.D. 449. They marched against the Picts and Scots, and having driven the invaders out of the kingdom, thus fulfilled their engagements. But they seemed in no hurry to leave the land in which they had thus gained a footing, and at length, either by fair means or foul, they became possessed of that part of the kingdom now known as Kent. Troops of Angles and Saxons, attracted by their success, now passed over from the continent, and in the course of 150 years founded kingdoms on various parts of the coast from the Isle of Wight to the Frith of Forth. Then commenced a struggle between the natives of the island and their savage invaders; but the Britons, unable to resist the Picts and Scots, could not withstand the Angles and Saxons. Some yielded, and were reduced to slavery; others left the country and settled in the northern parts of France; while the greater portion retreated westward to the mountainous parts of the island, that among their native fastnesses they might enjoy their freedom and preserve their faith.

And now a cloud of pagan darkness and savage barbarism again hung over the land. The Britons, while under the Roman rule, had received a knowledge of the

Gospel, and had exchanged their horrid superstition for the Divine truths of Christianity; bishops had attended the great Councils of the Church, and martyrs had suffered for the Truth's sake. But persecution like a flood now swept all before it,—priests were massacred, churches profaned, and the worship of Wodin and Thor took the place of that of the one true God. Brighter days, however, began to dawn; Augustine, with true apostolic zeal, laboured to spread the truths of the Gospel in the south of the island; while the monks of Iona (p. 129) were equally zealous in the north: and after two centuries of struggling and fighting, preaching and prayer, Egbert succeeded in uniting the whole Saxon population under one sceptre, and both sovereign and people were Christians, and to some extent civilized.

When Egbert succeeded in uniting the several kingdoms of the Saxon heptarchy (A.D. 827), his sway extended from the Frith of Forth to the shores of the English Channel; but a great part of the western half of the island was still in the possession of the Britons. The *kingdom of Cumbria* extended from the borders of Scotland to the river Mersey. Sometimes, however, this was included in the kingdom of *Strathclyde*, which reached from the Clyde to the Borders. *Cambria*, or *Wales*, remained independent until the thirteenth century; and the Britons of Cornwall and Devon, though subdued, for a long time preserved their ancient manners and language.

No sooner was Egbert firmly established on his throne than a new enemy arose :—

“The Danish raven, lured by annual prey,
Hung o'er the land incessant.”

The **Danes** inhabited the islands of Denmark, and were of the same race as the Jutes and Angles who had already settled in Britain, and the Normans who afterwards came. They were still pagans in religion, and like the Saxons, four centuries previously, were fierce and barbarous, but brave and fond of the sea. Their armies

and fleets were numerous—their attacks incessant; and at length Alfred was obliged to concede half his dominions to the Danish chieftain, Guthrun, upon condition that he became a Christian. Alfred thus defined the boundary of his own kingdom:—"Let the bounds of our own dominion stretch to the river Thames, and from thence to the water of Lea, even unto the head of the same water; and thence straight unto Bedford; and, finally, going along by the river Ouse, let them end at Watling Street." The country to the eastward of the line thus indicated, and extending from the Tweed to the estuary of the Thames, was henceforth known as **Danelagh**, or "Dane-law," and retained this name down to the time of the Norman conquest: and traces of Danish occupation may still be discerned in this part of the kingdom, in the names of places ending in *by, holm, ness, thwaite, thorp*, and *toft*. While Guthrun lived, he performed faithfully his part of the treaty with Alfred; but after his death, other fleets, conveying other invaders, came from the Danish shores. Battles, treaties, massacres, and retaliations marked the next century, until at length the Danish leader, Canute, became king of the whole of England (A.D. 1017). He was succeeded by his sons, Harold and Hardicanute, and then the Saxon line was again restored in the person of Edward the Confessor.

The Saxon aristocracy seems to have been without spirit and without influence; otherwise there would surely have been some leaders, who, after the death of Harold, might have led the native armies, and repelled the invading Normans. But as it was, William in one battle gained the throne, and proceeded straightway to portion out the kingdom among his brave followers. The Norman conquest is not an event to be deplored; for by that means a refined, gallant, and high-spirited aristocracy was introduced, and though the immediate results were degrading to the native population, it required but the lapse of two or three centuries to fuse the two races together, and produce the English nation. It will thus

be seen that the inhabitants of the British Islands, and of England especially, are a race mixed up of Celts, Saxons, Danes, and Normans, and that the wit and imagination of the Celt, the bravery and sagacity of the Saxons and Danes, and the high spirit and gallantry of the Normans, are combined together in an Englishman :—

"Tantæ molis erat Romanam condere gentem."

Our attention is now turned to another phase in the history of our country—the desire of conquest. William the Conqueror brought with him to the crown the duchy of Normandy and the Channel Islands, Jersey, Guernsey, Alderney, and Sark. Henry II., the first of the Plantagenets, considerably increased our French possessions. From his father he inherited Anjou and Touraine; and by right of his wife, Eleanor, he claimed Poitou and Aquitaine, which embraced all the west of France from the Loire to the Pyrenees. During the course of his long reign Henry also conducted a successful expedition into Wales, and subdued the eastern part of Ireland.

The original inhabitants of Ireland were of Celtic origin (p. 167), but afterwards the Scots, a Gothic tribe, invaded the island and became the ruling people; and hence, from the fourth century to the eleventh, Ireland was always known as Scotia or Scotland, and the people as Scoti or Scots. Christianity seems to have been introduced at a very early period; but the general conversion of the inhabitants was, doubtless, owing to the labours of St Patrick in the fifth century. For a long time after this, Ireland was renowned throughout Europe for its learning and piety, and missionaries thence proceeded, not only to Britain, but to various parts of the continent. When the Danes began their descents upon the British coast, Ireland did not escape, and the history of the struggles, fightings, and massacres, between the natives of the island and their savage invaders, were similar to those found narrated in our old Saxon chronicles. In the time of Henry II., the four provinces of

Ireland, Ulster, Munster, Leinster, and Connaught, had separate sovereigns; and one of these, Dermond, King of Leinster, seeking aid from England, Henry issued letters patent granting permission to any of his subjects to embark in the adventure. Some time after, Henry himself landed at Waterford; the princes of Ireland, except Ulster, surrendered to him, and after appointing a governor of Dublin, the English king returned from Ireland on Easter Monday, A.D. 1172.

A century later, Edward I. was king of England. He added Wales to his dominions (A.D. 1284), and attempted the conquest of Scotland. In this he was partially successful; but his successes were not followed up by his degenerate son, and the battle of Bannockburn (1314) secured to Scotland its liberty and independence. Edward III. aimed at a nobler prize, and claimed France in right of his mother, Isabella. The French nobles set aside his claims, but, assisted by his brave son, the Black Prince, he succeeded in gaining the brilliant victories of Crecy and Poitiers, and in taking John, King of France, prisoner. In the latter part of his reign, however, misfortune followed the steps of Edward. The Black Prince died, and all the English possessions in France, with the exception of Calais, Bordeaux, Bayonne, and a few other towns, were lost. Henry V. succeeded in regaining possession of all England ever possessed in France, with the exception of Auvergne, and added thereto Artois, Picardy, Champagne, and other possessions in the north-east; and his infant son, with the consent of the Parliament of Paris, was proclaimed King of France. But as Henry VI. grew up he showed none of the warlike qualities of his father; jealousy and disunion arose among his guardians; the Duke of Burgundy broke with the English; the Duke of Bedford died; and at length nothing was left to England but the town of Calais, with a marshy strip of ground surrounding it. Calais even was lost in the reign of Queen Mary; yet down as late as the commencement of the present century the kings of Eng-

land continued to style themselves *kings of France*, and bore the lilies of France on their shields.

We cannot regret the failure of the several attempts to annex France to the British dominions; for it has been well remarked, that if our former sovereigns had succeeded in their attempts, the seat of government would have been transferred to France, and Britain would have been a mere dependency. As it is, we have now a rich and powerful neighbour, with whom we have long maintained a rivalry in arms, but which henceforth will no doubt be a rival in commercial enterprise and in the arts of peace. In tracing down the history of our island from the earliest times, we may here anticipate a little, in order to mention the union of England and Scotland brought about by the accession of James I. (A.D. 1603); and we may remark that this event concludes another phase in our history—when the sovereigns of England, having given up the desire for continental conquests, succeeded in uniting the British Islands under one sceptre.

We must now dwell for a little upon the state of society in the ages we have been considering. At the time of the Norman conquest the population of England was probably about 2,000,000. In 1377, it was about 2,500,000; so that in the course of three hundred years very little increase had taken place. It is thought that the population was diminished by the frequent famines that occurred in this period, by the wars which raged between England and the neighbouring kingdoms—France and Scotland; and by the prevalence of plagues and pestilence, such as the pestilences of 1349. But, though very little change was visible in the amount of population, the face of the country and the state of the inhabitants had undergone great changes. A great part of the forests which once covered the island would, no doubt, by this time have disappeared, as up to the commencement of the fourteenth century, timber was the principal fuel of the inhabitants, and already large iron-furnaces were established in Sussex, which would require great quantities of charcoal. In 1306,

we find that the brewers and dyers of London, as they required great fires, began to use coal; but the nobility and gentry objected to it on account of its "noisome smell," and it was long before it could supplant the use of wood. It is curious to note that our manufactures received a great impulse at this time from the encouragement of the Edwards, and the immigration of the Flemings, though it required four centuries more to establish the close connexion that exists between our coal-fields and manufacturing districts.

It is generally considered that about the time of Richard II. the distinction of race—between the Normans and the Saxons—ceased to exist. The two peoples, like their language had become fused, and henceforth there was only the distinction of *class*, which, as it depends greatly upon civilisation itself, will, no doubt, always exist to some extent. A Byzantine historian, writing in 1400, gives the following account of England at this period :—"It is full of towns and villages. It has no vines and but little fruit, but it abounds in corn, honey, and wool, from which the natives make great quantities of cloth. London, the capital, may be preferred to every city of the west for population, opulence, and luxury. It is seated on the river Thames, which, by the advantage of the tide, daily receives and despatches trading vessels from and to various countries." The population of London at this time was about 35,000. Bristol had a population of 9500; Newcastle, 4000; and Hull about 2300. The principal trade of England, at this time, was with Ireland and the continent: the chief articles of export, besides those already mentioned, were tin, lead, skins, feathers, butter, cheese, guns, and gunpowder. The imports included fine cloths, wines, linens, fruits, spices, groceries, silks, and precious metals.

In the time of Queen Elizabeth the population of England amounted to about 5,000,000. The prosperity of the country made rapid strides during the reign of the Tudors. The discovery of America and the Cape had aroused the

spirit of enterprise, and England was not behind other nations. Frobisher and Davis attempted to find a north-west passage; Drake and Cavendish circumnavigated the globe; and Gilbert and Raleigh attempted to colonize the newly discovered America. The woollen manufacture was now in a flourishing condition, and the manufacture of silk into ribbons and laces had been introduced into England. The chief manufacturing towns at this period were London, Norwich, Coventry, Chester, Worcester, Exeter, York, Bristol, Southampton, Boston, Hull, and Newcastle-upon-Tyne. The principal trade at this time was carried on with the Netherlands, but English merchants now began to trade with Guinea, India, and Brazil. At first English traders used foreign ships, but owing to the impulse and encouragement given to shipbuilding by Henry VIII., an English navy gradually sprang into existence, and, in the time of Elizabeth, the sum total of English ships amounted to 181. The internal trade of the kingdom was carried on at this time, as it is now on the continent, by means of *fairs*: and among other places where fairs were held, may be mentioned Salisbury, Bristol, Oxenforth, Cambridge, Nottingham, Ely, Coventry, and the metropolis.

Yet though in the reign of Elizabeth the country had made such an advance in civilisation, the state of society and the condition of the people were far from being what they are at present. It is said that in the reign of Henry VIII. 72,000 thieves were put to death: and in the reign of Elizabeth, owing to the dissolution of monasteries and the enclosure of waste lands, large bodies of men without employment were wandering about the country, and there were at least 300 or 400 able-bodied vagabonds in every county, who lived by theft and rapine.

With the first of the Stuarts a new epoch commences, which has continued down to the present time. This we may term the period of *colonization*, and it is marked, also, by the extension of commerce. We reserve for another place a sketch of the growth of our Colonial Empire; and

in treating of the various manufactures we shall give a brief account of the origin and rise of the most important of them: it remains, therefore, that we conclude this chapter with a few facts—which cannot be conveniently inserted in any of the succeeding chapters—relating to the present political condition of the people of the British Islands.

Population.—The total population of these islands is nearly 30 millions, of which 20 belong to England and Wales, 6 to Ireland, and 3 to Scotland. In England the chief centres of population are London, South Lancashire, the West Riding of Yorkshire, and the neighbourhoods of Birmingham, Sheffield, and Newcastle; and it will be seen hereafter that, with the exception of London, these are the seats of our chief manufactures. The least populous county in England is Westmoreland, where there are only 76 inhabitants to a square mile, while the average for the whole of England is 380 to a square mile. London alone has a population almost equal to that of Scotland, and more than double that of Wales. The population of the larger towns we shall give in the chapters on manufactures and commerce.

In Scotland the inhabitants only average 100 to the square mile, as the Highlands, owing to their mountainous character, are, of necessity, but thinly populated. In the neighbourhoods of Edinburgh and Glasgow, however, there are 600 or 700 persons to a square mile.

Twenty years ago the population of Ireland exceeded eight millions; ten years since it did not amount to seven; this decrease was owing, in a great measure, to extensive emigration; and the movement is still going on, so that the present population does not amount to six millions. The western and southern parts of Ireland are the most thinly populated. The average for the whole island is about 180 to a square mile.

Civil Divisions.—England is divided into 40 counties; Scotland into 33; Ireland into 32; Wales into 12. The names and situations of these various divisions, with the

chief towns belonging to each, will be better learned from a map than from any detailed description. The division of England into counties is supposed to owe its origin to Alfred. *Shire* is a Saxon word meaning division, and is allied to "shed" in the word *watershed*. Under the Saxons the shires were governed by ealdormen or aldermen, and this title was changed by the Normans to *counts*, hence our term *counties*. In Alfred's division England contained only 32 shires. Durham and Lancashire were included in Yorkshire; Cornwall in Devon; Rutland in Northampton; Monmouth was deemed part of Wales; and Northumberland, Cumberland, and Westmoreland formed part of Scotland (p. 172). Durham, Lancashire, and Cheshire are termed counties *palatine*, because the owners of these counties—the Bishop of Durham, the Duke of Lancaster, and the Earl of Chester formerly exercised sovereign power in their respective shires, as fully as the king did in his palace (*palatium*); they are now, however, brought under the direct influence of the crown.

Government.—The British Islands constitute, when taken together, the United Kingdom of Great Britain and Ireland. The form of government is a limited monarchy, and consists of a Sovereign, a House of Peers, and a House of Commons. The executive power is vested in the Crown, and is carried out by Ministers appointed by the Sovereign. The legislative power belongs to the two Houses; but no act of theirs can become law without the royal consent; since the time of Queen Anne, however, this consent has not been once refused. The House of Peers consists of about 450 members comprising lords spiritual and temporal. The lords spiritual are the two archbishops and twenty-five of the bishops of the Church of England, together with one archbishop, and three bishops of the Church of Ireland. The lords temporal include all the peers of England, Great Britain, and the United Kingdom, with 16 representatives of the peerage of Scotland, and 28 of the peerage of Ireland. The

representative peers of Scotland are elected for each parliament; those of Ireland are elected for life.

The House of Commons consists of 658 members. Of these 500 are elected by the various counties and boroughs of England and Wales, and the Universities of Oxford and Cambridge; 53 are elected in Scotland, and 105 in Ireland. The House of Commons regulates the expenditure of the kingdom; and all money-bills must originate with that House. The annual expenditure exceeds £70,000,000, but almost one-half of this goes to pay the interest upon the National Debt, which now amounts to £800,000,000. This debt began under William III., but nearly two-thirds of it is due to the great war which arose out of the French Revolution.

Religion.—The people of Great Britain are, in general, Protestants; but the greater part of the population of Ireland—like all Celtic populations—are Roman-catholics. The Established Church of England is Episcopal in form, and is presided over by two archbishops and 26 bishops. The Archbishop of Canterbury is the first peer in the realm; the Archbishop of York is the third, the Lord High Chancellor ranking second. The Established Church of Scotland is Presbyterian in form, and its ministers are subject to a body called the General Assembly. In Ireland the Established Church is a branch of the Church of England, and is presided over by two archbishops and ten bishops; but four-fifths of the people of Ireland belong to the Papal persuasion. Throughout the British Islands every religious sect enjoys full toleration.

Education.—For the upper classes in England there are well-known public schools, such as Eton, Harrow, and Rugby, where the sons of the aristocracy are prepared for the Universities of Oxford and Cambridge. There are universities also at London and Durham. For the lower classes of Great Britain there is the Government system of education, presided over by the Secretary for Education, who is a Cabinet Minister. Under this system about 9000 teachers are engaged in instruction; there are at

least 25 colleges for training schoolmasters and schoolmistresses; and 60 inspectors are employed in examining the various schools connected with the system. The results are, upon the whole, very satisfactory.

In Scotland there are universities at Edinburgh, Glasgow, Aberdeen, and St Andrew's. In Ireland elementary education is under the direction of the National Board, and is assisted with Government aid. There is a university in Dublin connected with the Established Church; and at Belfast, Cork, and Galway, are Queen's Colleges, which afford secular education; these colleges together form the Queen's University.

Army and Navy.—The standing army of England amounts to about 220,000 men: there is besides a large body of militia, and the various volunteer rifle corps, recently formed throughout Great Britain, amount to nearly 200,000 men. England, owing to her situation, however, is rather a naval than a military power. The Royal Navy of England is superior to that of any other country in the world, and includes more than 600 ships of all sizes.

CHAPTER IX.

AGRICULTURE—HISTORY OF BRITISH AGRICULTURE—PRESENT STATE—ROTATION OF CROPS—AGRICULTURAL DEPARTMENTS.

History.—In speaking of the industrial employments of the people of the British Islands, we shall commence with agriculture, because though it does not now afford employment to the larger portion of the population, still it is the most ancient of all industrial occupations, and is perhaps the most important, being indeed essential to the very existence of a nation. It was in the reign of Henry VII. that agriculture received its first great impulse in England; but at this time, and for some years afterwards,

the breeding of sheep was the chief employment of the farmers, and wool was the principal export of the country. As population increased, however, there was a greater demand for corn, and hence its cultivation gradually took the place of sheep-farming. This change began to show itself towards the close of Elizabeth's reign.

The first English treatise on agriculture was published in the reign of Henry VIII. It was called the *Book of Husbandry*. In this reign, also, the culture of hops, and of the common garden vegetables, was introduced into England: turnips, clover, and potatoes first appear in the seventeenth century. Sir Walter Raleigh has the credit of having introduced the potato, and it is said that the followers of Charles II. introduced clover and turnips from the continent; but it is certain that both these vegetables were known and cultivated in England some years before the Restoration. From the time of Elizabeth until the middle of last century, England exported corn to other countries; but since that period, notwithstanding the improvements which have taken place in arable husbandry, this country, owing to the increase of population, has been compelled to import increasing quantities of grain annually.

Since the time of Robert Bakewell, who died 1795, great improvement has taken place in stock husbandry. He turned his attention to the improvement of cattle, especially sheep, by breeding, and so successful was he, that the "new Leicestershire sheep" became celebrated all over Europe. The example of Bakewell was followed by others: experiments were made with the North Devon and South Down sheep; the brothers Collinges established the Durham or Teeswater breed of "short-horns," and in 1798, the little Smithfield Club was established, and prizes were offered for fat stock.

Another name, intimately connected with the progress of agriculture in England, is that of William Coke, Earl of Leicester. No discovery in agriculture was made by this nobleman, but he showed surprising skill and sagacity

in singling out good ideas, and giving them fair trial. He reclaimed waste and barren lands, promoted the culture of turnips,—the importance of which was already becoming felt,—and improved, if he did not introduce the Norfolk system of the **Rotation of crops**. He also granted long leases to his tenants, and instituted annual sheep-shearings, where the surrounding farmers, while enjoying the hospitality of their landlord, might become acquainted with new breeds of cattle, new implements, and new modes of tillage, and might see the effect of these upon the estate of their liberal entertainer. The earl died in 1842, at the age of 90, and a monument was erected to his memory at a cost of £4000.

In 1837–38 was established the Royal Agricultural Society of England. The first meeting of the society took place at Oxford, 1839, and its first journal was established the year following. The influence of this society upon the progress of agriculture has been immense. Intelligent farmers from all parts of the country can meet at these annual gatherings and become acquainted with the latest improvements. Landlords are stimulated to enter into a generous rivalry with each other; knowledge is diffused generally, and prejudice removed. Among the various improvements which have taken place of late years in agriculture, and to which the Royal Society has in a great measure contributed, may be mentioned draining, artificial manures, and agricultural machines.

Attempts to drain have been made from the very earliest times, but no system of **Drainage** was understood till Mr Parkes expounded the principles of it to the Royal Society at a meeting at Newcastle in 1843. Since that time drainage has become universal, and, as Government has at various times advanced loans of money for the purpose, thousands of acres of land, at one time not worth a shilling an acre, have been converted into rich dairy-farms; and stiff clayey soils, which afforded uncertain crops of corn in favourable seasons, have been rendered light and friable. While draining was doing so much for

the land, **Artificial manures** were becoming generally adopted. Nitrate of soda and guano were imported from Peru, and thus not only was the fertility of the land increased, but owing to the portable manures, the limits of cultivation were extended. Steeps, which, from the impossibility of carrying up the requisite weight of farmyard manure, could not be brought under cultivation, are easily supplied with a few stones of bone-dust, or of some substance chemically prepared, and the soil is thus made capable of producing abundant crops.

It was between 1816 and 1836 that most of the **Agricultural machines** now in use were first brought into notice. Since that time the prejudice against them has in a great measure been removed, and the machines themselves have been gradually improved and perfected. In the best farms most of the operations connected with grass and arable land are now performed by machinery, and there is thus not only a saving of time and expense, but the work is done more efficiently. The making of agricultural machines is now a regular branch of trade, and at the meeting of the Royal Agricultural Society at Salisbury, in 1857, twenty manufacturers from all parts of England were present.

"One more gap remained to be filled up at the date of the Salisbury meeting in order to complete the mechanical requirements of a well-ordered farm, so that the stubble of the land, when the corn is sown by drill, reaped by horse-power, threshed out by steam, and sent in the shortest possible time by railway to market, should be at once broken up by the resistless force of a Steam Cultivator, instead of being left for the net-like twitch to spread and weeds to seed until the following spring. We almost believe, yet we dare not assert, that this crowning triumph of agricultural engineering has now been achieved. The retentive clays fertilized ten years back by deep drainage will then be brought to develop their full power of production by a gain of time often equal to a whole season."—[*Quarterly Review*, No. 206.]

Present State of Agriculture in the British Islands.
 —From what was said in the physical description of Great Britain and Ireland (Chapters I., VI.,) we might gather that Scotland is characterized by its mountains and moors, England by its fertile plains, and Ireland by its bogs. Hence we might infer that the proportion of land available for agriculture would differ very much in these different countries. The following table will give in round numbers a good general idea of the waste, cultivated, and cultivatable land in the British Islands :—

	Arable and Gardens.	Meadows, Pastures, and Marshes.	Wastes improvable.	Wastes not improvable.	Summary.
	Acres.	Acres.	Acres.	Acres.	Acres.
England .	10,250,000	15,350,000	3,500,000	3,250,000	32,350,000
Wales . .	900,000	2,250,000	600,000	1,000,000	4,750,000
Scotland .	2,500,000	2,500,000	6,000,000	8,000,000	19,000,000
Ireland .	6,350,000	7,150,000	5,000,000	2,400,000	20,900,000
Total .	20,000,000	27,250,000	15,100 000	14,650,000	77,000,000

From a reference to this table it will appear that the cultivated land in England exceeds three-fourths of the whole, while the wastes, incapable of cultivation, only amount to one-tenth. In Scotland, on the other hand, the cultivated land does not amount to one-third; in Ireland it is almost two-thirds. In no part of the world is agriculture better understood than in Great Britain; yet neither Scotland nor England can be strictly called agricultural countries, since the greater portion of the inhabitants in both countries are engaged in manufacturing and commercial pursuits. Ireland and Wales, on the other hand, are strictly agricultural countries, and a glance at the first two columns will show that they are better adapted for pasturage than tillage. Scotch agriculture is distinguished from English by the absence of permanent meadows or hay fields, and of those large hedgerows which add so much beauty to the English landscape.

The land in Scotland, also, is more generally let on lease, and agricultural machines are more generally adopted. In Ireland the soil is naturally of great fertility, and the climate favourable, especially to grazing and dairy produce; but there is a want of skill and capital, and the number of small farms operates unfavourably.

In the best cultivated parts of Great Britain, crops are raised in a certain rotation, according to the nature of the soil. Of these, there are four in general use.

First Rotation.—1. Potatoes or Turnips, the latter generally eaten off by sheep; 2. Barley, with grass seeds; 3. Clover; 4. Wheat or Oats.

Second Rotation.—1. Fallow; 2. Wheat; 3. Beans; 4. Barley, with grass seeds; 5. Hay; 6. Oats.

Third Rotation.—1. Part fallow; part Potatoes or Turnips; 2. Wheat; 3. Hay; 4. Pasture; 5. Oats.

The first rotation constitutes the celebrated Norfolk system; it is peculiarly adapted for light sandy soils, and when a portion of the turnip crop is eaten by the sheep, the texture of the land is rendered more firm by their treading, and thus becomes capable of producing grain. The second rotation is well adapted to rich alluvial clays, such as are found near the mouth of the Humber, and in the rich carse lands of Scotland. The third rotation is also suitable for heavy land, and is adapted for two-thirds of the soils of Great Britain. The system of adopting rotations instead of leaving the land fallow, first sprang up in Norfolk, and the object was to preserve the land from being exhausted, and also by having alternate green and white crops to keep the land free from weeds. But such has been the influence of high farming and artificial manures that the land has actually increased in fertility, and in places where these rotations have been used, crops of wheat have been raised every other year, and even two white crops in succession, thus constituting a *fourth* rotation.

Agricultural Departments.—As the various districts (Part II., Chapter I.) in Great Britain differ from each other in soil, and in some measure in climate, we might

expect that the agricultural produce of these districts would show a corresponding difference, and that the three great branches of agriculture,—tillage, dairy farming, and grazing,—would be adapted to different parts of the island. We have already pointed out the important connexion there is between the geology of any country and its surface, scenery, and soil; and nowhere are there found better examples of this than in Great Britain. If we draw a line from the mouth of the Tees, through Leicester and Bath, to Lyme Regis (p. 101), we shall divide England into two parts differing very much from each other in geological character, and also in industrial character: to the east of that line the country is purely agricultural, to the west of it the people are engaged principally in mining and manufactures. As a general rule the districts where the older geological systems prevail are rich in minerals, while districts belonging to the more recent systems have fewer minerals, but a richer soil. Perhaps the Old Red Sandstone forms an exception to this rule, as the Old Red districts of Scotland (p. 97), and the county of Hereford in England are exceedingly well adapted for agriculture.

Climate also has some influence on the agricultural character of a district. A moist climate is better adapted for pasture than for tillage, and hence Ireland excels in dairy produce. It has often been remarked, also, that most of the wheat produced in England grows on the east side, while the western counties, which receive more rain, are the dairy counties.

From these remarks it will be inferred that the different districts into which we divided Great Britain, when speaking of its surface and minerals, will differ from each other in agricultural characteristics; and some of these points of difference we shall now briefly notice.

In Scotland, all to the north of Strathmore is a pastoral region, which affords scanty subsistence to sheep and black cattle. North of the Caledonian Canal, and west of the Cromarty Frith, wheat will not ripen, and the grains

principally raised are barley and oats. The Cheviots and Lowthers form another large pastoral region, and the Cheviot sheep are noted for the fine texture of their wool and the quality of their mutton. In those parts of Scotland where the Old Red Sandstone prevails there are, however, tracts of great natural fertility. Strathmore has been already noticed (p. 97), and the Carse of Gowrie is especially famous for its orchards. In the Lothians, including the counties of Linlithgow, Edinburgh, and Haddington, and indeed in all the eastern counties of Scotland, large quantities of potatoes are grown to supply the London market. On the western coast the counties of Dumfries, Ayr, and Renfrew are chiefly noted for dairy produce, and the northern part of Ayrshire produces the famous Dunlop cheese.

Turning now to England, we find that the Pennine district differs in character from the other agricultural districts of England. It is more mountainous than any other part of England, and this, together with its higher latitude, gives it a colder climate. Hence, it has a great extent of pastoral country, and it is the seat of many important manufactures; nevertheless there are some tracts of great fertility to be found, as in Northumberland, Durham, and Cumberland: in Lincoln, and in parts of Yorkshire and Derbyshire. These tracts are mostly noted for tillage. Cheshire, and parts of Derbyshire and Yorkshire, are celebrated for dairy produce; and the vale of the Tees, Cleveland (in North Yorkshire), and Holderness, are noted for sheep, cattle, and horses. Potatoes are cultivated to a great extent in Cumberland, Westmoreland, and Yorkshire; and wheat, barley, oats, and rye, are crops common to the whole district.

The central region of England, as it has no marked features in physical geography, so has it no marked features in agriculture. Towards the east the counties of Leicester and Northampton are noted for the breeding and fattening of sheep and cattle; in the west, Shropshire, Gloucester, Wiltshire, and Dorset, are principally devoted

to dairy produce; while mixed husbandry is carried on in the other parts. Hops are cultivated in the counties of Worcester and Hereford, and the latter county, with Devon, is noted for apples and cider.

The Chalk district embraces the principal wheat-growing counties—Norfolk, Suffolk, Essex, Kent, Surrey, Sussex, Hampshire, Berkshire, and Hertfordshire; and in most of these counties the fattening of sheep and cattle is associated with arable industry. The different chalk-ranges, together with the low grounds round the Wash and Romney Marsh, afford excellent pasturage for sheep, of which many varieties are found in this district. In Great Britain there are two species of sheep—the *long-woolled* and the *short-woolled*. The long-woolled species embraces the Teeswater, the Lincoln, the New Leicester, and the Romney Marsh breeds; and these have no horns. The short-woolled species includes the Cheviots, the Black-faced breed, and the South Downs. The Cheviots, it has already been remarked, are very common in Scotland; the Black-faced breed, which furnishes the best flavoured mutton, is widely diffused through the mountainous parts of England and Scotland; the long-woolled species are found on the banks of the Tees, and in the fens round the Wash, and in Romney Marsh; while the South Downs are spread over all the dry chalky soils of the south of England.

Turnip industry, on which the fattening of sheep so much depends, is carried on to a considerable extent in Norfolk, and in the adjoining counties of Lincoln and Suffolk. Hops are cultivated in Kent and Surrey.

In the Devonian district, the climate is milder than in other parts of the island (p. 160). The myrtle flourishes in the open air; agriculture, however, is only in a backward condition. Arable, as well as pasture and dairy husbandry, are pursued, and Devonshire is noted for its apples. Wales, owing to its mountainous character, is chiefly devoted to pasture, and we have already seen that out of nearly 5,000,000 acres, only 900,000 are devoted to arable and garden lands. Tillage is confined to the

valleys lying between the various mountain-ranges, and to the plains lying along the coast; and the chief crops cultivated are wheat, oats, barley, and potatoes.

In Ireland, as we have already mentioned, a fertile soil and favourable climate have been rendered in a great measure inoperative through the want of skill and capital, and through the number of small farms. Various other reasons for the backward state of agriculture in Ireland might be given, among which we may mention the unsettled state of the country, the absence of the great landowners, the practice of sub-letting farms, and the rude nature of agricultural machines. To these reasons we may add the fact that it is too purely an agricultural country;—more people are engaged in this branch of industry than the country can support. Ireland is not well adapted to the growth of wheat, as the climate is too moist, and there is not sufficient warmth of sun to ripen the grain; but it is well adapted to pasture, and even its mountains are covered with a rich verdure, capable of supporting cattle and horses. The potato is the chief crop in Ireland: the soil and climate are both well adapted to its growth, and the country is noted both for the excellent quality and surprising quantity of the potatoes raised in it. Next to potatoes the chief crop is oats: wheat and barley are also raised in various parts, and clover and beans have been introduced into the southern counties. In the province of Ulster flax and hemp are grown, but only in small quantities. Large numbers of cattle are reared and exported to England: the counties in which oxen are chiefly bred are Limerick, Tipperary, Roscommon, and Meath. Sheep are raised in the same counties, and in Galway and Clare; and there is a fine breed of short-woolled sheep peculiar to the mountains of Wicklow. Goats are very common in mountainous regions, and are kept chiefly for their milk; and hogs are everywhere to be found.

Dairy-farming is the best branch of Irish agriculture, and large quantities of excellent butter are exported to England. The best is made in the county of Carlow.

CHAPTER X.

BRITISH MANUFACTURES.—COTTON.—WOOLLEN.—LINEN.
—SILK.—IRON AND HARDWARE.—EARTHENWARE.—
GLASS.

We have already mentioned that in Wales and Ireland agriculture forms the chief occupation of the people, while in Great Britain the population is chiefly engaged in manufacturing and commercial pursuits. In Ireland it is estimated that three-fifths of the population depend on agriculture, while in Great Britain only about one-fourth are so engaged, and one-half are supported by trade and manufactures. It is only within the last century that this preponderance in manufacturing and commercial pursuits has arisen; formerly in England and Scotland, as in other countries, the cultivation of the land afforded the chief employment. Various causes might be assigned for the great progress made by Great Britain in her manufactures, and one or two we shall briefly mention.

1. *Supplies of Coal*.—Great Britain, as we have already seen (p. 91), is abundantly supplied with coal; and since the invention of the steam-engine, and its application to machinery, most of our manufactures have been transferred to the various coal-fields. East of a line drawn from the mouth of the Tees to Lyme Regis not a seam of coal is to be found, and this, as we have before observed, is a purely agricultural district.

2. *Excellent Machinery*.—In most of the coal-fields an abundance of iron is found, and thus we are supplied with material for making machinery as well as with steam to drive it. And, indeed, it is upon the excellency of machinery that the superiority of British manufactures chiefly depends. In other countries labour may be cheaper, and in some the raw material may be more easily obtained, but as yet no country can equal Great Britain in the speed and perfection of machinery. This

is a fact well known to English manufacturers, and in Leeds, Manchester, and Glasgow, machine-making is a special branch of industry.

3. *A Firm and Enlightened Government.*—Many are the advantages we derive from such a government. There is security of property with freedom of action. Men are encouraged to invest their capital in various undertakings, which promise a sure, though not immediate profit; lucrative branches of trade are not monopolized by a favoured few, and each man follows that employment to which he feels himself best suited. We owe it to our free government, also, that England has become an asylum to the oppressed of all nations, and our manufactures have gained much from the welcome we have ever given to foreigners. In the reign of Edward III. the woollen manufacture received an impulse from the Flemings who were encouraged to settle in this country; and three centuries later, the silk trade derived equal benefit from the French refugees.

The principal branches of manufacture carried on in the British Islands are those of the textile fabrics—cotton, woollen, linen, and silk—together with hardware, earthenware, and glass.

The Cotton Manufacture.—This important branch of industry seems to have been introduced into England in the reign of Charles I. "Manchester cottons" are, indeed, mentioned at a much earlier period, but the goods so named were composed of wool; and the first authentic mention of cotton, properly so called, is in the *Treasure of Traffic*, published in 1641. In that work we are informed that the people of Manchester bought cotton wool at London, which had come from Cyprus and Smyrna, and that the manufactured goods were again sent to London to be exported. From the first introduction of cotton into Great Britain down to the year 1773, it was the practice to have the *weft* only of cotton and the *warp* linen. And it was customary for merchants to give out to families in their employment a certain

quantity of warp, together with a proportionate quantity of cotton wool, which was to be spun into weft and then woven. At this time spinning was performed by the spindle and distaff, and weaving by the hand-loom. In 1733, however, John Kay, a native of Bury, invented the fly-shuttle, which enabled the weaver to throw the shuttle both ways by one jerk of his hand, and thus he was enabled to do double the quantity of work in the same time. This caused an increasing demand for weft, and men began to think of some quicker way of producing it than by the common spinning-wheel.

In 1767, James Hargreaves invented his spinning-jenny. At first, his machine enabled eight threads to be spun as easily as one, formerly; but afterwards it was brought to such perfection, that a little girl was enabled to work from eighty to one hundred spindles at once. The cotton thread thus produced was admirably suited for *weft*, but had not the strength required for the warp. Two years afterwards, however, Richard Arkwright invented his machine for spinning by rollers. The yarn produced by this machine is well adapted for warp, but is too firm and hard to be suitable for weft, and thus it supplemented and completed the invention of Hargreaves. And now mills began to be erected for carrying on the spinning of yarn. The first was erected at Nottingham, and worked by horse-power; the next was put up at Cromford, in Derbyshire, and was driven by water. The numerous streams in South Lancashire, owing to their rapid descent, were found well adapted for driving machinery, and mills were erected on every available spot. The same year in which Arkwright took out his patent (1769) is marked by Watt's invention of the steam engine, but it was some years later before steam became a motive power in the cotton mills. In the meantime other inventions, perhaps still more important than those of Hargreaves and Arkwright, were discovered.

In 1775, the *mule-jenny* was invented by Samuel Crompton. "Crompton's attention was first called to

the subject by the fact, that Arkwright's roller process, as well as Hargreaves' jenny process, produced threads imperfectly twined and full of soft knots. His idea was, that if he could continue the draw of the thread after it passed through the rollers, and then superadd the spinning process provided by the jenny, he might be enabled to overcome and remedy the defect. And this, in a few words, is the character of his invention, which is an ingenious cross between the water-frame and the jenny. Hence its designation of the spinning *Mule*."—(*Quarterly Review*, No. 213.) Through these various inventions, such quantities of cotton yarn were produced, that weavers were not found to use it up, and hence it began to be exported in large quantities, while cotton fabrics were imported into England. It happened that Dr Cartwright, a clergyman of Kent, was staying in Derbyshire, and meeting with some Manchester gentlemen at a public dinner in Matlock, the conversation turned upon the recent improvements in cotton spinning. Dr Cartwright suggested that Arkwright should now turn his attention to inventing a weaving machine. Every one declared the thing impracticable; the doctor, however, thought the matter over, and at length succeeded in inventing the power-loom (1787). The application of steam to the power-loom gave another great impulse to weaving, and England now no longer imports cotton fabrics, but exports them, as well as cotton yarn.

Present State.—In 1758, the total import of cotton wool into England did not amount to 3,000,000 lbs., and this came chiefly from the Levant and the West Indies. In 1858, the quantity imported exceeded 1,000,000,000 lbs., and of this, four-fifths came from America. Previous to the outbreak of the war now (1864) raging in America, the total value of the cotton manufactures exported and retained for home consumption, was said to amount to £70,000,000 annually, while the raw material cost about £30,000,000. Whether the cotton trade will ever again reach its former prosperity seems very doubtful. In the

meantime, strenuous efforts are being made to obtain supplies of the raw material from other cotton-fields. India has already greatly exceeded the usual quantity of its exports of this article, and it is thought that if its resources were properly developed, cotton might be grown there sufficient to supply the whole of Europe. Supplies are also expected from the West Indies, especially Jamaica; from Queensland, Natal, Egypt, Western Africa, China, and Brazil.

Seats of the Manufacture.—In England the chief seat of the manufacture is in the neighbourhood of the South Lancashire coal-field: and the chief towns are Manchester, Ashton, Oldham, Bury, Bolton, Blackburn, and Preston, in Lancashire; Stockport, in Cheshire; and Glossop, in Derbyshire.

Manchester is situated on the Irwell (p. 119), at the junction of the Irk and Medlock. It is the great centre of the cotton trade, and is, perhaps, the first manufacturing city in the world. The city, with the neighbourhood ten miles round, absorbs about three-fourths of the cotton trade. It also manufactures silk goods, and machinery, to a considerable extent. In 1720, the population was 24,000: at present it exceeds 400,000. **Ashton-under-Lyne** is a thriving and prosperous place on the left bank of the Tame. **Oldham**, near the source of the Irk, owes its rise entirely to the cotton trade. A century ago it consisted of a few thatched tenements; at present, it has a population of 72,000. It is surrounded with collieries; and the coal, which is of excellent quality, furnishes the chief supplies for Manchester, Ashton, Rochdale, and other manufacturing towns.

Bury is agreeably situated on a rising ground between the Irwell and a feeder, the Roch. The woollen manufacture, introduced here in the reign of Edward III., is the staple of the place; but there are also numerous factories for the spinning of cotton, and it is noted for its large print-works. Chamber Hall, in the immediate vicinity of the town, was the birthplace of the late Sir Robert Peel. **Bolton**—

le-Moors is situated on the Croale, an affluent of the Irwell. In the fourteenth century the woollen manufacture was introduced here by Flemish immigrants, but it is to the manufacture of cotton that Bolton owes its present importance. Sir Richard Arkwright was at one time a poor barber in Bolton, and, as his rude signboard announced, he gave "A clean shave for a penny." **Blackburn** is an irregularly built town standing on an affluent of the Ribble. James Hargreaves was a native of this place. **Preston** stands on the estuary of the Ribble, and is the handsomest of the cotton towns. **Stockport** is situated at the junction of the Tame and Goyt, and was at one time chiefly engaged in the silk manufacture, but cotton is now the staple of the place. **Glossop**, the chief seat of the cotton manufacture in Derbyshire, stands upon the Goyt.

Besides the places already mentioned, the counties of Derby, Leicester, and Nottingham, consume large quantities of cotton in the manufacture of lace; and at **Nottingham** the manufacture of cotton stockings gives employment to a great number of persons.

In Scotland, the cotton manufacture is carried on principally in the counties of Lanark and Renfrew,—Glasgow and Paisley, with their immediate neighbourhood, being the chief seats. It is also carried on to some extent in the counties of Ayr, Perth, and Aberdeen. We shall describe Glasgow in speaking of the seaports of Great Britain. **Paisley**, next to Glasgow, is the chief manufacturing town in the west of Scotland. Besides the cotton manufacture, it also carries on a manufacture of silk, and is especially noted for its shawls. It stands upon the Cart, a feeder of the Clyde.

The cotton manufacture of Ireland is of very little importance, and is confined chiefly to the north. Belfast, the chief seat, is also the centre of the linen trade.

Woollen Manufacture.—This manufacture seems to have existed in Great Britain from the earliest times, for, during the Roman occupation, we find that woollen cloths were made at Winchester for the use of the emperors.

For a long time after the Norman conquest, however, our ancestors were surpassed by the workmen of Flanders; and it was customary to export English wool to Bruges and other Flemish cities, whence fine cloths and other products were received in exchange. Several of our English sovereigns, even before the time of Edward III., encouraged Flemish emigrants to settle in this country; and in the reign of Henry II., the cloth manufacture was introduced by them into Peebles, Lanark, Aberdeen, and other places in Scotland. In 1331, John Kempe, and a number of other Flemish artisans, being invited over by Edward III., settled in different parts of the country: this event is often looked upon as the commencement of our woollen manufactures. A few years later (1340) worsted was made in England. It received its name from Worstead, a small market town in Norfolk, where the manufacture was first introduced. In the reign of Elizabeth, another colony of Flemish refugees, fleeing from the persecutions of the Duke of Alva, settled at Norwich, Canterbury, and in other places. But, though England made some progress in spinning wool and making cloth, the art of dyeing was but imperfectly understood, and the manufactured cloth was generally sent over into Flanders to be dyed. In 1608, however, the art of dyeing was introduced from the Low Countries, and this art was greatly improved by some Flemish settlers in 1688. In 1750, carpet weaving was introduced into England by French artisans. The inventions of Arkwright, Crompton, and Cartwright were applied to the woollen and linen manufactures, as well as to those of cotton, but not with the same success. This was owing partly to the fact that wool and flax are not so well suited to machinery as cotton; and partly because of sundry vexatious enactments that were in existence. In the reign of Edward VI., an act had been passed for putting down the use of machinery in woollen manufactures, and this statute was not repealed until the year 1807.

Present State.—The total quantity of wool imported

into England in 1862 amounted to nearly 172,000,000 pounds, which we might value at £12,000,000 sterling: the total exports of woollen goods and yarn the same year amounted to about £15,000,000. More than two-thirds of the large quantity of wool imported comes from British colonies: Australia furnishes 60,000,000 pounds; the East Indies 20,000,000; the Cape nearly as much. At one time, as we have already remarked, wool was the chief export from England, and then it was of the finest quality. But since agriculturists have turned their attention to breeding sheep, the wool has deteriorated; for the breeder tries to hasten the sheep for the market, and cares only for the flesh, while the fineness of the wool is a work of time. The *Merino* wool, derived from Spanish sheep, was for a long time noted for its quality; but in 1765, the Merino was introduced into Saxony, and by this means the Saxon breed of sheep was improved, and in time was found superior to the Spanish. Both the Merino and the Saxon breeds have been naturalized in Australia. Very little wool is now imported from Spain—about 600,000 pounds annually; while the annual amount from Germany exceeds 10,000,000 pounds: we also get about the same quantity from South America. In 1836, the wool of the Alpaca was introduced, and is now extensively used in our manufactures, as is also *Mohair*, the wool of the Angora goat.

Seats of the Manufacture.—In England there are two principal seats,—one in the Yorkshire coal-field, and one in the neighbourhood of the Bristol coal-field. In the Yorkshire district the chief towns are Leeds, Bradford, Halifax, and Huddersfield; and we may also mention Rochdale in Lancashire. The other district includes the counties of Gloucester, Wilts, and Somerset; and the chief towns are Stroud, Bradford, Trowbridge, and Frome. In North Wales the manufacture of flannels is carried on to some extent in the towns of Dolgelly, Welshpool, Newton, and Wrexham.

Leeds, situated on both sides of the Aire (p. 122), is

the first woollen town in the kingdom. It stands on a rich coal-field, and by means of canals and river communication is connected with Hull and Liverpool. The staple manufacture is woollen, but the spinning of flax and worsted are important branches of industry, and there are also factories for making steam-engines and other machinery. The present population exceeds 200,000. **Bradford**, situated on an affluent of the Aire, is a busy thriving town. The principal business of the place consists in the production of worsted yarns and stuffs; there are extensive dye-works in the town and vicinity. **Halifax** stands on the Hebble, a branch of the Calder. Its staple manufacture is woollen, but the cotton manufacture is carried on to a considerable extent, as are dyeing and the manufacture of mill machinery. **Huddersfield** is a well-built town on the banks of the Colne, a branch of the Calder. It manufactures woollen cloths and fancy goods, such as shawls and vestings. **Rochdale** stands on the Roch, a feeder of the Irwell. Its chief manufactures are woollen and cotton goods, and flannel making is carried on to a great extent. Rochdale has communication with Leeds, Halifax, Manchester, and Liverpool, both by canal and railway.

Stroud, near the junction of the Stroud-water with the Gloucestershire Frome, stands on a hill-side, and is the centre of a busy cloth-manufacturing district. The streams in the neighbourhood are well suited for driving mills, and the Stroud-water is peculiarly adapted to the dyeing of scarlet and other colours. **Bradford**, on the lower Avon (p. 134), is noted for its woollen cloths, especially those made from the Saxony and Spanish wools. **Trowbridge**, on a feeder of the Avon, has some manufactures of tweeds and other narrow woollens, but the trade is very depressed. **Frome** is pleasantly situated on the declivity of a hill, at the base of which flows the river Frome, a feeder of the Avon. The town has long been noted for its woollens, especially broad-cloths and kerseymeres; it has also silk and hat factories.

Dolgelly is beautifully situated in a narrow vale, on

the north side of Cader Idris (p. 104). It manufactures Welsh flannels, kerseymeres, and a kind of woollen cloth called "webs," chiefly exported to America. The cloths are made in the houses and cottages of the weavers. **Welshpool**, on the Severn, was formerly the chief market in North Wales for the manufacture of Welsh flannels, but the trade has been transferred, in a great measure, to **Newton**, which lies higher up the river, and which has been called the "Leeds of Wales." **Wrexham** stands on an affluent of the Dee, and is the centre of a mining and manufacturing district.

Before concluding an account of the woollen manufactures of England, we should mention that *carpets* are made to a great extent in Yorkshire, in the city of **Durham**, at **Kidderminster**, which is situated on the Stour in Worcestershire, and at **Axminster**, in Devonshire, though the trade in the last place has greatly declined. **Dewsbury**, in Yorkshire, on the river Calder, has important cloth and carpet manufactories, but is chiefly noted for its *shoddy mills*. In these mills, woollen rags are torn to pieces by machinery, and, having been reduced to their original state of wool, are again made into cloth. This shoddy makes blankets, druggets, table-covers, and army clothing. The town of **Leicester** is noted for the manufacture of woollen stockings.

In Scotland the woollen manufacture is carried on in the vale of the Tweed, and in the counties of Ayr, Stirling, and Aberdeen: the chief towns are Galashiels, Hawick, Stirling, Bannockburn, and Kilmarnock.

Galashiels stands on the Gala, a feeder of the Tweed. The term "tweeds" was first applied to a particular kind of cloth made here. A great deal of foreign wool is now used, especially in the making of flannels, which are noted throughout Scotland for their fine texture. **Hawick**, on the Teviot, in spite of many disadvantages—being 50 miles from the sea, and 40 from the nearest coal-field—has become an important manufacturing town. It is chiefly distinguished for its stockings, flannels, and

blankets. **Stirling** is extremely well situated upon the Forth, about midway between Edinburgh and Glasgow; it is noted for its tartans. **Bannockburn**, memorable for the victory of Bruce, stands on a small stream called the Bannock, about two miles south-east of Stirling. It has long been noted for its woollen fabrics, especially tartans, shawls, and tweeds. **Kilmarnock**, on the north side of the river Irvine, in Ayrshire, is noted for its carpets.

In Ireland the woollen manufacture has not made much progress, the goods made being chiefly of the coarser kinds. The chief manufacturing centres are Dublin, Kilkenny, and Wicklow. Of Dublin we shall have occasion to speak in the next chapter. **Kilkenny** is a well-built town on the river Nore. Its trade is not so important as formerly. In the neighbourhood are extensive collieries and quarries of marble. **Wicklow**, on the east coast of Ireland, at the mouth of the Vartrey, is a place of small importance.

Linen Manufacture.—Linen was first manufactured in England by Flemish artisans in 1253. From England the manufacture spread into Scotland, and was then introduced into Ireland in the reign of James I. In 1698, the parliament of England, in an address to William III., stated that it would be for the public advantage if the woollen manufacture were discouraged in Ireland, and the linen manufacture established in its stead. Measures were adopted accordingly; heavy duties were imposed upon Irish wools and woollens, and premiums and bounties given for the encouragement of the linen trade. The result is, that the woollen manufacture has almost died out, while that of linen has become the staple of the country. Similar enactments have been in force in other parts of the British Islands. Before the Union of England and Scotland, natives of the latter country were forbidden to use any material for the making of *shrouds*, except plain linen which had been made in the kingdom. At the Union, however, it was thought advisable to encourage the staple manufacture of England, and it was therefore

enacted in the *last* Scottish parliament, "that where linen has been made use of about dead bodies formerly, plain woollen cloath or stuff shall only be made use of in all time coming." A similar Act had been passed in England in the reign of Charles II., and, though very unpopular, was not repealed until 1814. These various restrictions and bounties had a great deal to do with localizing the woollen and linen manufactures, but whether they tended to the ultimate benefit of the British Islands in general, is rather a doubtful question.

In England the spinning of flax is carried on to a great extent, but linen weaving is not very general. The stiffness of the fibres prevents flax from being worked up by machinery so easily as cotton, or even wool; but a few years ago, a process was invented for softening the flax, and converting it into what is called *flax cotton*, and in this state it may be worked very easily.

Flax is grown in the north of Ireland, and in some parts of Scotland, but most of the raw material for this manufacture is obtained from Russia, Prussia, Holland, Belgium, and the East Indies. The total value of the flax and hemp imported is about £7,000,000; and the value of the linens exported to foreign countries is about the same.

Seats of the Manufacture—In England the chief seat is in the West Riding of Yorkshire. At **Barnsley**, and in the neighbourhood, damask and diapers are made, and there are large flax-mills in Leeds and other places.

In Scotland the linen manufacture is confined to the east coast; the chief centres being the towns of Dundee and Dunfermline. **Dundee**, situated on the north side of the Frith of Tay, is noted for the coarser kind of goods, and a great deal of *jute* is here worked up. The raw material comes from the Baltic and the East Indies, and coals are brought from the basin of the Forth, or even from Newcastle. The goods exported are, for the most part, sent to London, Liverpool, and Glasgow, to be shipped from these ports, it being more advantageous to

send them abroad as parts of general cargoes than to send whole cargoes from Dundee. Other towns in the county of Forfar, such as **Arbroath** and **Montrose**, are also engaged in the linen trade. **Dunfermline**, in the county of Fife, stands about four miles from the northern shore of the Frith of Forth. It is chiefly noted for its fine linens, especially table-cloths.

In Ireland, as we have already remarked, linen forms the staple manufacture. The two principal centres of the trade are Belfast and Drogheda. Belfast we shall describe in a subsequent chapter. **Drogheda** stands on both banks of the river Boyne, about four miles from its mouth. In and near the town are several large mills for the spinning of flax and cotton, and a considerable trade is carried on with Liverpool. A good deal of linen is manufactured in the north of Ireland by cottagers, who grow their own flax, spin it into yarn, and then weave it with the handloom.

Silk Manufacture.—It is said that silk was worn, for the first time in England, by ladies who attended a tournament at Kenilworth, in the reign of Edward I. The manufacture of this fabric seems to have been introduced into this country in the fourteenth century. It received a great impetus from the influx of the French refugees, consequent upon the revocation of the Edict of Nantes (1685). The first silk-throwing mill in England was set up at Derby, by Thomas Lombe (1719), who had become acquainted with the mechanism in Italy. He was rewarded for his services with knighthood, and Parliament voted him a grant of £14,000. Down to the year 1825, foreign silks were subject to heavy duties, in order to protect the native manufacture. Since then, however, the duties have been gradually reduced, and an article in the late French treaty provides for the importation of manufactured silks, duty free. We import silk, both in a raw and manufactured state, from China, Italy, France, and the East Indies, and the value is said to amount to £13,000,000 annually. We export manufactured silks to the value of

about £3,000,000; these go chiefly to our colonies, and to the United States.

Seats of the Manufacture.—The manufacture is chiefly confined to England: there is a little made at Glasgow and Paisley; and Irish poplins are manufactured at Dublin, but not to any great extent. The chief places in England are Spitalfields, in the east of London; Coventry, Derby, Macclesfield, and Manchester.

Coventry is situated in the county of Warwick, not far from the source of the Anker (120). Its staple business is ribbon-making.

Derby, on the Derwent (p. 121), is well situated for manufactures, having an extensive command of both coal and water power. Besides silk, it manufactures porcelain, jewellery, and ornamental articles made out of *spar*; and it has also extensive lead-works. **Macclesfield** is pleasantly situated on both banks of the Bollin, a feeder of the Mersey. It manufactures silk in all its branches, and also cotton to some extent.

Iron and Hardware.—We have already noticed the amount of iron produced in Great Britain, and mentioned three most productive coal-fields (p. 105). Formerly, when charcoal was used in the smelting of iron-stone, the great iron-works were in the best wooded counties, such as Kent and Surrey, and then there were numerous furnaces in Ireland; but after it was discovered that coke would do equally as well as charcoal, and was much cheaper, the iron-works were removed to the coal-fields. We have already mentioned that the three great iron-districts in Great Britain are South Wales, South Stafford, and the district between the Clyde and Forth. To these we may now add the coal-fields of Shropshire and Yorkshire. Of late years the district of Cleveland, in North Yorkshire, has become noted for its iron-stone; and very recently (1858) iron of the finest quality has been found in the Oolitic rocks of Lincolnshire.

The metal, when extracted from the ore by means of the furnace, is called pig-iron, and large quantities are

exported in this state. By far the most part, however, is manufactured into articles of every description, from stupendous bridges and huge steamboats to the delicate mainspring of a watch. The term *hardware* is applied to iron goods in general, exclusive of the heavier kinds; *cutlery* is a branch of hardware, and includes sharp instruments only. The total value of the hardware and cutlery annually exported amounts to about £3,500,000; the machinery and steam-engines to about the same; and the iron and steel to about £10,000,000. The principal places engaged in the iron and hardware trade are Merthyr Tydvil, Colebrookdale, Birmingham, Dudley, Wolverhampton, Walsall, Bilston; Sheffield, Rotherham, Middlesbrough; and in Scotland, Glasgow, Airdrie, and Carron.

Merthyr Tydvil is the centre of the iron-district of South Wales. The town lies on the east side of the vale of the Taff, and the houses lie scattered in detached masses about the valley and on the hills; and fresh groups are continually rising in the neighbourhood of the great iron-works. **Colebrookdale**, as the name implies, is rather a district than a town. It is a beautiful valley, through which flows the river Severn, which is here crossed by a cast-iron bridge of one arch, having a span of 150 feet. Here are extensive works, where steam-engines and all kinds of machinery are manufactured. The valley is connected by canals with the great iron-district of South Staffordshire.

Birmingham stands in the north-west corner of Warwickshire, and not far from the borders of the counties of Stafford and Worcester. It is a very ancient town, and has been noted for its hardware since the time of the Romans. It is only within the last century, however, that it has risen to importance, and now it is perhaps the first city in the world for the manufacture of hardware. It produces articles of all kinds, from the flimsiest trinket to the most ponderous machine. Among other branches of business may be mentioned the manufacture of steam-

engines firearms, steel pens, buttons, pins, and gold rings. Its present population is nearly 300,000. **Dudley**, though it belongs to Warwickshire, lies in the county of Stafford. The principal trade of the place consists in the smelting and working of iron; and considerable quantities of flint-glass are also made. "The Dudley coal-basin is an eminent example of the great facilities possessed by this country for the manufacture of iron. Here we find the ironstone associated with coal, the limestone required for the flux, and the refractory fire-clay used in constructing the interior brick-work of the furnaces." **Wolverhampton** has long been celebrated for the manufacture of locks; but the best are now made in London and Birmingham. Its staple business at present is, perhaps, japanned ware. **Walsall**, on a small feeder of the Tame (p. 120), is noted for the manufacture of stirrups, spurs, and bits. **Bilston** lies about three miles to the south-east of Wolverhampton, and has large iron and brass foundries. Indeed, the whole district of south Staffordshire is covered with forges, furnaces, foundries, and coal-pits.

Sheffield is situated at the confluence of the Sheaf and the Don. Cutlery is the most important branch of industry here, and the town is also noted for the manufacture of steel, plated goods, and files. Most of the steel used in Birmingham and other places is manufactured at Sheffield. **Rotherham**, at the confluence of the Rother (p. 122) and the Don, has long been distinguished for its manufacture of cast-iron, and during the American and French wars it almost exclusively supplied the navy with cannon. The manufacture is still kept up with much vigour.

Middlesbrough, situated in or near that part of Yorkshire known as Cleveland, stands on the south bank of the Tees, about three miles from its mouth. The site of the town forty years ago was occupied by a solitary farmhouse. Its rapid rise has been owing to its coal and iron trade. The railway to Bishop Auckland connects it with the Durham coal-field, and the export of coal was the

first cause of its prosperity. Of late years iron-works have sprung up, and there are at present about 70 furnaces in the neighbourhood.

Airdrie, situated about 11 miles east of Glasgow, on the high road from Glasgow to Edinburgh, is in the centre of the richest mining district in Scotland. It has some cotton factories, but it owes its rise chiefly to the coal and iron trade. The Calder iron-works, in the vicinity, employ a great many hands. The population of Airdrie is now about 13,000. **Carron** is a village in the county of Stirling, and stands upon the stream of the same name which falls into the Frith of Forth. During the late French war, the iron-works here were, perhaps, the most extensive in Great Britain, and were chiefly celebrated for the manufacture of cannon, mortars, howitzers, *carronades*, and bombs. At present the works are engaged in the smelting of iron-ore, and in the manufacture of all kinds of cast-iron goods: the number of hands employed in the works exceeds 2000.

Earthenware.—The manufacture of earthenware,—under which term we include not only pottery, but also porcelain or chinaware,—is carried on chiefly in the North Staffordshire coal-field, the district being called the “Potteries.” All through this district the soil contains a great variety of clays, and under the clays are rich beds of coal; so that there is every facility for carrying on this manufacture. This branch of industry, however, made little progress until about a century ago (1760 or 1762), when Mr Josiah Wedgwood began a series of improvements. He not only improved the composition, glaze, and colours of the old wares, but invented several new ones, such, for example, as the cream-coloured *Queen's Ware*. By aid of the sculptor Flaxman, he made great improvements upon the figures of the articles made, and thus exercised a beneficial influence upon public taste. The village of Etruria, where his works were situated, was built by him, and his descendants yet reside there.

The finer clays, used in the potteries, come from Purbeck Isle (p. 140), and from Devonshire; and a substance called *Kaolin* or China clay, which is found in Cornwall, is used in making the best china; large quantities of flint, used also in the manufacture of porcelain, are exported from Kent, and some from Wales and Ireland. The quantity of earthenware exported from Britain—most of which goes to the United States—amounts in value to about £1,500,000 annually. The principal places engaged in the manufacture are the "Potteries" with Burslem as the centre, Worcester, and Derby. Burslem has long been noted for its potteries, and two centuries ago it was the principal place in the kingdom for the manufacture of earthenware. It has a population of about 20,000: the population of the whole district of the Potteries is about 70,000.

Worcester is finely situated on the east bank of the Severn, in a beautiful and fertile valley, and is one of the best built and handsomest towns in England. Its chief manufactures are gloves and porcelain. It is also the centre of considerable trade in salt, coals, and iron. About 30,000 tons of salt are now annually sent down the Severn from Droitwich. The hop plantations of Worcestershire extend over more than 1000 acres, and most of the produce is brought here for sale.

Glass Manufacture.—In the time of Queen Elizabeth glass windows were luxuries even to the nobility. The second Duke of Buckingham, in the time of Charles II., materially improved the British manufacture by bringing workmen from Venice, which had long been noted for this art. The manufacture was still further improved by the French refugees (1685), and England soon after began to export glass bottles. In 1773, a company was formed at St Helens, Lancashire, for the production of plate glass, which had previously been imported; and at the commencement of the present century a similar company was formed at Newcastle. At present the principal seats of the manufacture are at Newcastle, South Shields, Sunder-

land, and the vicinity; at Dudley, Stourbridge, and other towns in that neighbourhood; and at Liverpool, Bristol, and other places.

We have now mentioned the chief manufactures of the British Islands; but other branches of industry, such as the manufacture of leather, paper, watches, and jewellery might be referred to, did space permit. Shipbuilding is a trade most important to a maritime people, and it is extensively carried on in many of our ports; but we shall notice this employment in the next chapter when giving a sketch of the principal ports in the British Islands.

CHAPTER XI.

COMMERCE.—CAUSES AND EFFECTS OF COMMERCE.—HOME TRADE. — FOREIGN TRADE. — CHIEF PORTS IN GREAT BRITAIN AND IRELAND.

Commerce is merely the exchange of commodities between different nations. The character and extent of this exchange depend upon three things:—articles of exchange, means by which to exchange, and persons to make the exchange. Articles of exchange generally consist of the produce of any country, and may be either natural or artificial. Natural produce includes minerals, timber, the produce of fisheries: artificial produce is that raised by the hand of man, such as the produce of agriculture and manufactures. Sometimes, however, a country may have very little produce to export, either natural or artificial, of its own, and yet may possess a large commerce in trading with the produce of other countries. Thus Holland and Denmark have a large carrying trade.

Means of exchange implies facility of communication, which may be either internal or external. Internal communication includes roads, rivers, canals, and railways;

external communication depends greatly on the extent and character of the coast line. Russia and Austria are deficient in external means of communication. Sometimes, however, a country may possess both articles of commerce and means of exchange, yet want an energetic people to conduct the trade: this is the case with most of the States in South America.

There are other causes which influence commerce, some of which we mentioned in speaking of the manufactures of the British Islands. Among these we may mention the character of the government, and import and export duties. The restrictions upon trade are generally laid for one of three purposes—to raise the revenue of the country; to protect the home trade; to protect colonial trade. As regards the second and third reasons, it is now generally admitted that if any branch of trade or manufacture needs protection, except in giving it a start, it is not worth the trouble it costs. If a branch of industry be suitable for any locality, it will succeed without protection, and the struggles consequent upon fair competition will rather strengthen than weaken it. As regards raising the revenue it would be out of place here to discuss whether direct or indirect taxation is more desirable. It will be sufficient to remark that, so far as commerce is concerned, free trade is beneficial.

Much might be said, did space permit, upon the advantages derived from commerce. Besides giving employment to vast numbers of people, and increasing the national wealth of the countries engaged in it, we may mention three effects which are its immediate fruits:—First, it gives a stimulus to manufactures, since the more goods there are disposed of the greater will be the efforts made to supply the demand. New inventions will be tried, improvements introduced, and capital laid out upon the manufacture, if its produce has a ready sale. Secondly, social comforts are increased. If we were confined to the produce of our own country, of how many articles of food and luxury would we be deprived! But through exchange

and commerce we get the produce of the most distant lands brought to our very doors. Thirdly, civilisation is extended: the most commercial nations are generally among the most civilized, and as the merchants and traders penetrate the interior of continents, or explore new lands in search of markets, they carry with them the arts and habits of civilized life. Peace is also more favourable to commerce than war, and hence a commercial people will not wantonly engage in those bloody contests which have so often checked, and even destroyed, the progress of civilisation.

Applying the principles, before laid down, to England, we find that she possesses all that is necessary for an extended commerce. She has produce, means of exchange, and an energetic population, and hence her commerce is as superior to that of other nations as are her manufactures. Her produce consists both of raw materials—especially minerals—and of manufactured goods. Her means are good internal communication, good ports, and a numerous navy. Her people are skilful, energetic, and enterprising, and, like all the Teutonic race, fond of the sea.

In speaking of the commerce of the British Islands we shall treat, first, of the home trade; secondly, of the foreign trade.

Home Trade.—Throughout the British Islands, means of communication are very efficient, and especially so in England. It is said that the united length of the turnpike roads in England amounts to 24,000 miles, and there are about 12,000 miles of railway. In Scotland, also, railways connect the principal cities, and in Ireland this system of transport is fast developing. The British Islands, as we have seen, have numerous navigable rivers, and not only has the navigation of many of these been considerably improved and extended, but canals also intersect the country in various directions, so that it is said that there is scarcely any place in England more than 15 miles distant from water communication. In Scotland,

two great canals run across the whole breadth of the country. The Caledonian Canal, which runs through Glenmore (p. 94) cost a million sterling, but has not proved so serviceable as was expected; and in the south of Scotland a canal connects the estuaries of the Clyde and Forth. In England, three connect the basin of the Humber with that of the Mersey—the Leeds and Liverpool, the Rochdale, and the Huddersfield canals. The Grand Trunk joins the Mersey and Trent, and from it another canal runs past Birmingham to London. The Thames and Severn are connected by a canal crossing the Cotswolds; and the Severn and Trent are connected by the canal of Worcester and South Stafford.

By these several means of communication, goods are easily transported from one part of the kingdom to another; so that prices of food and clothing vary very little in different places, and the produce of our manufactures is sent with facility to the various towns from which it is exported. Besides this internal trade—of which no authentic account can be given—there is a considerable cross-channel trade between Great Britain and Ireland, and a flourishing coasting trade between London and various ports of England and Scotland.

Home Trade, in official language, signifies trade “on the coasts of the United Kingdom, or to ports between the limits of the river Elbe and Brest.” The number of British vessels engaged in this trade is nearly 12,000; and the coal-trade forms its most important branch. We have already seen that many of the coal-fields of Great Britain are the seats of flourishing manufactures. The coal of Durham and Northumberland, however, is best adapted for domestic purposes, and some millions of tons are annually sent to London and other ports. Quantities of coal are also sent from the Whitehaven coal-field to Ireland; and the ports of Irvine, Ardrrossan, and Troon, on the coast of Ayrshire, carry on a considerable trade with Ireland, exporting coal and iron, and receiving in return oats and cattle. But the principal

trade of Scotland is with England, to which she sends the produce of her manufactures, and receives in return woollen goods, hardware, and cutlery. There are also considerable quantities of potatoes and salmon sent from the eastern counties of Scotland to London.

The commerce of Ireland is almost entirely confined to the home trade. The principal exports are agricultural produce and linens; and the chief imports, manufactured goods from England, and colonial produce; but the foreign trade of Ireland is of very little importance.

Foreign Trade.—The computed real value of the total imports into the United Kingdom in 1862 amounted in round numbers to £227,000,000, and the exports to £167,000,000. Ireland imported foreign goods to the amount of £6,000,000, and her *direct* exports did not exceed £230,000. The imports into Great Britain consist principally of raw materials for her manufactures, and of articles of food and luxury. The values of some of the raw materials imported we have given in the preceding chapter, and we shall now add some of the other great imports, with their computed values in round numbers, and the places from which they are severally imported.

Corn and Flour.....£35,000,000	{ United States, Russia, Prussia, British N. America, France, Turkey, Egypt.
Sugar.....13,000,000	{ East and West Indies, Mauri- tius, Brazil.
Timber, Dyewoods, &c.....10,000,000	{ British N. America, Countries round the Baltic, East and West Indies, Western Africa, Central and Southern Amer- ica, the Levant.
Tea.....9,000,000	{ China and the East Indies.
Butter.....5,000,000	{ Holland, United States, Bel- gium, France.
Seeds (Linseed chiefly).....4,300,000	{ East Indies, Russia, Prussia, Holland.
Oils (Fish, Palm, Cocoa, } Olive)4,000,000	{ Western Africa, British North America, East Indies, Italy.
Wine.....3,800,000	{ Spain, Portugal, France, Italy, the Cape.
Copper Ore.....3,800,000	{ Cuba, Chili, Australia.

Tallow.....	£3,000,000	{ Russia, United States, South America, Australia.
Indigo.....	3,000,000	{ East Indies.
Coffee and Cocoa.....	3,000,000	{ Ceylon, West Indies, Brazil.
Hides.....	3,000,000	{ East Indies, Brazil, States of La Plata, Australia.
Rice.....	2,000,000	{ East Indies, United States, Java.
Guano.....	2,000,000	{ Peru chiefly.
Tobacco.....	2,000,000	{ United States, Cuba, Turkey, Holland.
Spirits.....	1,800,000	{ West Indies, France, Holland.

The principal *corn* districts in Europe are the south and south-western parts of Russia, the provinces of Galicia and Hungary in Austria, and the Danubian provinces of Wallachia and Moldavia. *Odessa* is the chief outlet for the produce of Russia, *Dantzic* for Galicia and the neighbouring provinces, and *Galatz* for the Danubian provinces. The annual amount of corn imported steadily increases with the increase of population in this country, but it fluctuates according to the kind of harvest in England. Owing to the abundant crops of last harvest (1863), it is thought the imports of grain this year will be lessened by the enormous sum of £20,000,000.

The *timber* which we get from British North America and the countries round the Baltic consists chiefly of pine and fir. We import logwood and other dyewoods from Honduras, and other places in Central and South America. Mahogany comes from the West Indies, and a variety of ornamental woods, as rosewood, satin-wood, and ebony, from the East Indies and Western Africa. Teak also is imported chiefly from India and Western Africa, and boxwood from Turkey and other countries in the Levant.

The *sugar* imported into the United Kingdom is for the most part raw, and the *tobacco* is, most of it, in an unmanufactured state. At least half the *coffee* and *rice*, and more than half the *indigo*, is re-exported. A great many untanned hides, some tea, and large quantities of raw silk, wool, and raw cotton, also form part of the foreign and colonial produce re-exported. The countries

to which these articles chiefly go are Russia, Prussia, the Hanse Towns, Holland, Belgium, France, and our possessions in Australia and the East Indies. France takes about one-fourth of the total export, and Holland and the Hanse Towns are also great buyers.

Turning now to the exports from the United Kingdom, we mentioned that they amounted, in 1862, to £167,000,000. If now we subtract £43,000,000, which was about the value of the foreign and colonial produce re-exported, we have £124,000,000 as the value of the produce of the United Kingdom exported that year. The articles consist chiefly of manufactured goods, and the values of some of the most important of these we have already given. We shall now, therefore, direct our attention to the countries to which we send our exports. We find, in the first place, that our own foreign possessions take one-third of the total exports of our home produce. In a subsequent part of the work, when treating of each colony separately, we shall mention the imports and exports from and to the parent country; it will be sufficient, therefore, to remark here, that the East Indies and Australia take more than all our other foreign possessions put together.

Among foreign countries some of our best customers will be found below, with their imports from Great Britain, given in round numbers.

The United States.....£14,000,000	Foreign West Indies...£3,000,000
France.....9,000,000	Egypt.....3,000,000
Hanse Towns.....9,000,000	Prussia.....2,000,000
Holland.....6,000,000	Belgium.....2,000,000
Italy.....5,000,000	Portugal.....2,000,000
Brazil.....3,700,000	States of La Plata.....1,800,000
Turkey.....3,500,000	Chili.....1,400,000
Russia.....3,000,000	Peru.....1,000,000
Spain.....3,000,000	Hanover.....1,000,000
China.....3,000,000	Sweden and Norway.....1,000,000

Previous to the outbreak of the present war in America, our exports to the *United States* were much larger than they are now. In 1860, they exceeded £21,000,000,

and in 1859, they amounted to £22,500,000. The commercial treaty with *France*, which came into force in 1860, has given a great stimulus to the trade with that country. Our total exports (including both home produce and colonial produce) to France in 1859, amounted, in round numbers, to £9,500,000, in 1860 to £12,700,000, and in 1861 it exceeded £17,000,000. By the *Hanse Towns* are meant Hamburg, Bremen, and Lubeck. Of these, Hamburg has by far the greatest trade; and the great amount of exports taken by these cities, as well as by *Holland*, may be explained by the fact that they command the navigation of the Elbe, Weser, Rhine, and Meuse, and thus act as entrepôts for the countries drained by those rivers. One million, also, may be deducted from the value of the exports to Holland, as representing the exports to Java and Sumatra. Under the term *Italy* we include Sardinia, Tuscany, and the Two Sicilies, and under *Turkey* we include Wallachia and Moldavia, Syria and Palestine. The exports to Turkey proper, however, are nearly £3,000,000, for it serves as a kind of entrepôt for the countries of Western Asia. Under the term *Foreign West Indies* we include the possessions of Spain, Denmark, Holland, and France, as well as Hayti. The exports to Cuba alone amount to nearly £1,300,000; and next in importance are the exports to the Danish West Indies. By the *States of La Plata* we mean Uruguay and Buenos Ayres. The exports to the latter amount to £1,300,000.

External Means of Communication.—Great Britain is connected by various submarine cables with Ireland on the one side, and the continent of Europe on the other. We have already referred to the cable laid across the Atlantic between Ireland and Newfoundland (p. 43), and recently another route to America has been proposed by Colonel Shaffner. He proposes that a submarine cable should be laid from the north of Scotland to Thorshaven in the Faroe Isles; thence it will proceed to Iceland, and, crossing the island, will be continued to the coast of

Greenland, and touch the shore at some point south of 61° north latitude. The line is then to be continued across Greenland to Julianshaab, and another submarine cable will connect that point with Hamilton's inlet on the coast of Labrador. The total length of cable to be laid under water will be about 1725 miles, but in no case will the submerged line exceed 600 miles in length. Deep-sea soundings have been made in various parts, and it is hoped that throughout its whole length the cable may be laid in a bed of mud and sand. Between Scotland and Iceland the sea is nowhere deeper than 1000 fathoms. From Iceland to Greenland the ocean gradually sinks to 1540 fathoms, and then shelves upwards; and between Greenland and Labrador the depth is nowhere more than 2090 fathoms. These depths, although offering no obstacle to the submergence of the cable, are yet sufficient to protect it from the influence of the polar currents or the abrasion of icebergs. The war-ship *Bulldog*, under Sir F. L. M'Clintock, which was sent out by our Government to take soundings along the whole route, having returned, the commander of the expedition reports that the explorations afford much encouragement for the national undertaking. Dr Rae also reports that the land line is practicable, and that the shore ends can be submerged without difficulty. The Danish government gave its consent to the undertaking some years ago.

Telegraphic wires cross the continent of Europe in various directions, and there are several submarine cables in different parts of the Mediterranean. A cable is laid down the Red Sea from Suez to Aden, and this has been continued through Muscat to Kurrachee. It has been proposed to extend this telegraphic communication to the frontier of Southern China, and even as far as Australia; but, unfortunately, very long submarine cables do not work satisfactorily, though there can be no doubt that science will eventually overcome even this difficulty. A line also connects London with Bagdad; and it is intended to continue it, through Persia and Beloochistan, to India.

The *Great Eastern* is another example of a bold project ending in total failure. It is of such a size and make that it is calculated it could make a voyage to Australia in about 36 days, and carry with it, not only coals for the whole passage, but also a cargo of 10,000 tons. This large vessel is only the first of three, which the Great Eastern company intended to have built, and which were to be employed in the trade between England and the East. One of these monster ships was to leave this country every month for Trincomalee, in the island of Ceylon. At the Cape it would be met by a feeding steamer carrying goods and passengers to Australia; and at Trincomalee it could be met by steamers from Bombay, Madras, Calcutta, Singapore, Hong Kong, and Shanghai. The monthly clearance of vessels for the East is about 80,000 tons, so that eight vessels, each the size of the *Great Eastern*, might get a full cargo every month. A series of unfortunate accidents, and perhaps some mismanagement, has caused heavy losses to fall upon the shareholders of the Great Vessel, and has injured its *prestige* with the public; but there really appears no reason why it should not fulfil all the expectations that were ever formed about it.

Principal Ports of the United Kingdom.—In England the chief ports, given in order of importance, are London, Liverpool, Hull, Bristol, Newcastle, Southampton, Sunderland, and we may add the three great naval ports, Portsmouth, Plymouth, and Chatham.

London stands on both sides of the Thames, but principally on the north side, about 45 miles above the mouth of the river. It is the largest and richest city in the world; covers an area of nearly 50 miles, and has a population of nearly three millions. It possesses important manufactures, and has extensive commerce. In the east at Spitalfields, as we have before mentioned, silk weaving is carried on; tanning gives employment to many in Southwark; while at Clerkenwell, in the north, we have the manufacture of watches and timepieces. The west end is

the fashionable quarter of the city, and here are some of the finest public buildings, such as Westminster Abbey, Buckingham Palace, and the New Houses of Parliament. St Paul's Cathedral, however, which is, perhaps, one of the finest buildings in the kingdom, lies in the east of London.

In the extent of its foreign trade, London is surpassed by Liverpool, and, perhaps, by New York; but its enormous coasting trade is not surpassed by any port in the world as regards number of vessels and amount of tonnage. The exports consist of manufactured goods, which are sent from all parts of the kingdom, and foreign and colonial produce, which is re-exported. The imports include produce from all parts of the world, but especially from India, China, and Australia.

Liverpool is situated on the north side of the river Mersey, and extends about three miles along its bank, and one mile inland. As London is the great centre of the coasting trade, so Liverpool is the great emporium of the foreign trade of Great Britain. It exports nearly half the exported produce of the United Kingdom, and is the great outlet for the counties of Lancashire, Cheshire, Staffordshire, and Warwickshire. Its principal trade is with the United States, the West Indies, South America, and Ireland; and its chief imports are cotton, hides, timber, and agricultural produce. It has a population of about 450,000. **Birkenhead**, on the opposite side of the Mersey, is a thriving place, with magnificent docks.

Hull stands on the north side of the estuary of the Humber, at the mouth of a small river called the Hull. It is now perhaps the third port in the kingdom, and trades with the Baltic, Mediterranean, and South America. It is the outlet for the counties drained by the Ouse and Trent, and the chief exports are woollen and cotton goods, earthenware and hardware. The principal imports are corn, timber, iron, wool, flax, hemp, tallow, and hides. Hull is the principal port in Great Britain for the northern whale-fishery. It has a population of about 100,000.

Bristol, on the Lower Avon, about ten miles from its mouth (p. 134), was at one time the second port in England, and is now perhaps the fourth. The foreign trade is not so extensive as formerly, but the trade with Ireland is considerable. It has some important manufactures of glass, sugar, and brass. The population is about 150,000.

Newcastle, on the Tyne, is an important river port. The chief export is coal, which is sent to London, France, the Baltic, and the Mediterranean. There are also important manufactures of glass, machinery, and chemical products, and shipbuilding is carried on to a considerable extent. The present population is about 110,000. **Southampton**, on the inlet known as Southampton Water, is a handsome and prosperous town, and a packet station to the West Indies, Lisbon, and Alexandria. It is also the principal station for steamers to Havre, Dieppe, and other French ports, since by setting out from Southampton, the difficult navigation from North Foreland, round by Dover and Beachy Head, is avoided. It is connected, by rail, with London. Its population is about 48,000. **Sunderland**, at the mouth of the river Wear, is next to Newcastle, the chief place for the export of coal; it is also noted for its shipbuilding. **Bishopwearmouth**, a suburb, is on the same side of the river, and **Monkwearmouth**, on the north bank, is connected with it by a stupendous iron bridge of one arch, and of sufficient height to allow vessels of 400 tons to pass beneath. The population of the town and its suburbs is little short of 80,000.

Portsmouth, on Portsea Isle, is the first naval station in England; its dockyard covers an area of 100 acres, and its fortifications are superior to any other in the kingdom. **Plymouth**, on Plymouth Sound, is the second naval station in England. It consists really of three towns, Plymouth, Devonport, and Stonehouse, all of which are built on an unequal piece of ground between the rivers Tamar and Plym. Shipbuilding is here carried on to a considerable extent. **Chatham** stands on the south side

of the river Medway, adjacent to the city of Rochester. It has a large dockyard, artillery-park and barracks, and is strongly fortified.

The principal seaports in Scotland are Glasgow, Greenock, Leith, Aberdeen, Dundee, and Montrose. Dundee and Montrose having been already mentioned (p. 203), we shall, therefore, now only speak of the other four.

Glasgow, situated on the river Clyde, is the great centre of the commerce and manufactures of Scotland. Formerly **Port-Glasgow**, which is 19 miles lower down the river, was the deep-water harbour for the city; but the navigation of the Clyde has been so much improved of late years, that vessels of 1000 tons burden can now reach Glasgow. As we have already mentioned (p. 197), this city is the great seat of the cotton trade in Scotland, and there are also important manufactures of silk and machinery; while the chemical works of St Rollox were at one time considered the largest in Europe. The building and fitting up of steam-ships is a branch of business extensively pursued. The chief exports are manufactured goods, coal, iron, and machinery; the imports are chiefly grain and flour, fresh and salted meat, raw cotton, timber, and colonial produce. A branch of the Forth and Clyde canal (p. 213) joins Glasgow at Port-Dundas. The population is about 400,000.

Greenock, about 22 miles below Glasgow, has important manufactures and considerable trade. Shipbuilding and sugar-refining are carried on to a considerable extent. It is an important emigration port for America and Australia; the chief imports are sugar, grain, and timber. **Leith**, on the southern shores of the estuary of the Forth, is the port of Edinburgh, and has considerable trade, especially with the Baltic. This port labours under many disadvantages, since, at low water, the tide recedes a considerable distance from the shore. Various improvements, however, which have recently been made, will greatly extend the accommodation for shipping. The Duke of Buccleuch has constructed a fine harbour at **Granton**,

about a mile to the west of Leith, and this port has now a considerable share of the shipment of goods both for the north and to London. **Aberdeen**, between the mouths of the Dee and Don, is the seat of considerable trade. It has some manufactures of cotton and woollen, and in the neighbourhood are fine quarries of granite. Aberdeen is the seat of a University (p. 182), and has a population of 80,000.

The chief ports in Ireland, taken in the order of their importance, are Belfast, Dublin, Cork, Waterford, Limerick.

Belfast, on Belfast Lough, is the second city in Ireland in size and wealth, and the first in trade and manufactures. It is the chief seat of the linen manufacture in Ireland, and also contains important cotton factories. There is considerable foreign trade, but the most important branch of its commerce is the cross-channel trade with Scotland and England. Population about 120,000.

Dublin, the capital of Ireland, stands at the mouth of the Liffey. The city itself is very beautiful, but the harbour for commercial purposes is very poor (p. 158), and large vessels unload at Kingston, at the entrance of the bay, whence there is rail to the capital. Dublin has some manufactures of woollen and silk, and the foreign import trade is considerable. The population of the city is about 300,000. **Cork**, at the mouth of the river Lee, is the third city of Ireland in size and importance. It has some manufactures of woollen, linen, and cotton, and shipbuilding is carried on to a considerable extent. Its harbour is one of the finest in the United Kingdom (p. 157), and its foreign trade is important. **Queenstown** forms the principal port of Cork, as only the smaller vessels are able to reach the city. **Waterford**, being the great outlet for the counties drained by the Barrow, Nore, and Suir, exports more agricultural produce than any other port in Ireland. Vessels of 800 tons burden can reach the quays: there is steam communication with Bristol. **Limerick** is the principal outlet for the counties drained by the Shannon, and has likewise considerable trade. The chief exports are corn and other agricultural

produce; the imports, timber, iron, and colonial produce. The manufacture of lace is carried on to a considerable extent.

CHAPTER XII.

ISLANDS ADJACENT TO GREAT BRITAIN—ISLE OF WIGHT
—THE CHANNEL ISLANDS—THE SCILLY ISLANDS—
ANGLESEY—ISLE OF MAN—ARRAN AND BUTE—THE
HEBRIDES—THE ORKNEY ISLANDS—THE SHETLANDS.

In describing the coast of Great Britain (Chap. V.), we have already mentioned several of the islands which are immediately adjacent, but some of these require a more detailed notice. If we glance at a map of Great Britain we are struck with the fact that there are no islands of importance on the east coast, while on the west they are numerous and large. On the south coast also we have the Isle of Wight, and on the north the Orkney and Shetland groups. In giving a brief notice of some of the most important islands adjacent to Great Britain we shall commence with the Isle of Wight, and then, proceeding down the Channel, shall take consecutively the islands off the west and northern coasts.

The Isle of Wight is separated from the coast of Hampshire by a channel having an average breadth of two miles, but contracted in one part to half that distance (p. 140). The island is rhomboidal in shape, has an area of about 135 square miles, and possesses a healthy climate and fertile soil. A range of chalk-hills crosses it from west to east, and seems to be a continuation of the range which, after forming the Dorset Heights, runs through Purbeck Isle as far as St Alban's Head (p. 140). The river Medina divides the island into two parts, and empties itself, on the north, into the Solent. Large quantities of fine sand are shipped from Freshwater Bay—which lies

on the west coast—for the glass and china manufactures of England, but there are no other minerals of importance found in the island. The chief towns are Newport, Ryde, and Cowes. **Newport**, near the centre of the island, is the capital. About a mile and a half from the town is Carisbrooke Castle. **Cowes**, divided into East and West Cowes by the river Medina, is the chief port in the island; and in the vicinity is Osborne House, one of the summer residences of the Queen.

The Channel Islands.—These islands can scarcely be said to be adjacent to Great Britain, since they lie nearer the coast of France; they belong, however, to this country, and are the only remnant of our Norman possessions. They consist of the islands of Jersey, Guernsey, Alderney, and Sark, with some dependent islets. The two largest islands are those first mentioned. The climate is very mild, and the soil productive. Large quantities of apples are grown for making cider, and the islands are celebrated for a fine breed of cattle, known as the Alderney breed. The island of Alderney, which is the most northerly of the group, is about 55 miles from Portland Isle, but is scarcely nine miles distant from the coast of France, from which it is separated by a channel called the *Race of Alderney*. The total area of the group is about 93 miles; and the population amounts to about 90,000. The fisheries of Jersey are valuable, and embrace lobster, oyster, and cod. The larger islands possess considerable trade, as they are almost exempt from taxation. The capital of Jersey is **St Helier**, which is situated on the south side of the island. **St Pierre** is the chief town of Guernsey, and stands on the east coast of that island.

The Scilly Islands.—These islands we have already mentioned (p. 141). They are about 145 in number, but only six are inhabited, and the largest of these is St Mary's, which is about nine or ten miles in circumference. The inhabitants are chiefly employed as pilots or fishermen. Some suppose that this group represents the ancient *Cassiterides*, or tin islands, with which the Phœnicians

traded, but others suppose that this term was applied to the western parts of Cornwall.

The **Isle of Anglesey**, which forms one of the Welsh counties, is separated from the mainland by the **Menai Strait**. The surface is, upon the whole, flat, but **Holy Island**, which is connected to it on the west side by two embankments, rises 700 feet above the sea. The soil is not very fertile, and the climate, though mild, is unfavourable to the growth of trees; but minerals are abundant. The coal-field of Anglesey we have already mentioned (p. 105), and we may add copper, lead, and silver ore, limestone and marble, as the other mineral productions. The total area of the island is about 270 miles, and the population 60,000. The chief towns are **Beaumaris**, **Holyhead**, and **Amlwch**. **Beaumaris**, the county town is situated on the western side of **Menai Strait**, near its northern extremity. The town is well built, but has no trade or manufactures, and is chiefly resorted to in the summer season for the purposes of seabathing. **Holyhead** stands upon **Holy Island**. It carries on ropemaking and shipbuilding to some extent, and is one of the chief packet-stations to Dublin. A submarine telegraph has been laid down between **Holyhead** and **Howth**. **Amlwch** (pronounced *Amlook*) is built on the north coast of Anglesey. The principal trade of the place consists in *copper ore*, which is obtained from the neighbouring **Parys Mountains**, though the supply is not so great as formerly.

The **Isle of Man** lies in the Irish Sea, about midway between Great Britain and Ireland. It is about 30 miles long and from 10 to 12 broad, containing an area of 220 square miles. A range of hills runs through the island in a longitudinal direction, and culminates in **Sneafell**, which rises 2004 feet above the sea. The soil is various, but not very fertile, and the inhabitants are chiefly engaged either in the lead-mines and slate-quarries, or in the herring-fishery. The climate is mild, but agriculture is backward, and the manufactures are inconsiderable. The

chief towns in the island are Douglas, Castleton, Peel, and Ramsey. **Douglas** is finely situated on a semicircular bay, on the south-east side of the island. It is a great resort for seabathing. **Castleton**, situated at the southern extremity, is the capital of the island, and the seat of the governor. In the town and its vicinity are several breweries, tanneries, lime-kilns, and corn-mills. **Peel**, situated on the west side of the island, was the former capital, but is now a decayed place. **Ramsey**, on the north-east coast, is one of the packet-stations between Glasgow and Liverpool. The total population of the island is about 52,000.

The early history of the Isle of Man is closely connected with that of the Hebrides, and the kingdoms of Norway and Scotland. It seems that in the reign of Harold, King of Norway, some of the inhabitants of that country, dissatisfied with the stern rule of their sovereign, emigrated to the Western Islands of Scotland. Here the colonists prospered and grew powerful, but having unfortunately annoyed, in some manner, the mother country, Harold, in a great expedition (about A.D. 870), conquered Orkney, Shetland, the Western Isles, and Man, and added them to his hereditary dominion. For more than three centuries, Norway was powerful enough to retain possession of these conquests, but in 1263, Alexander III. having defeated Haco, King of Norway, in the battle of Largs, the sovereignty of all these islands was transferred to Scotland. The Isle of Man remained in possession of Scotland until the reign of Henry IV., when that monarch took possession of it, and bestowed it upon the Stanley family (1406). For the next three centuries it was held by the Stanleys, afterwards Earls of Derby, and their successors the Dukes of Athole; but, in 1765, the parliament purchased from the Duke of Athole his civil and military rights for the sum of £70,000. A further arrangement was made in 1826, and Great Britain now enjoys all the rights and privileges of sovereign of the island.

The natives of the Isle of Man belong to a mixed race

of the Celts and Norwegians, and the language, which is called *Manx*, partakes also of this mixed character, though the Celtic element preponderates. The bishop of the island is styled "Bishop of Sodor and Man." *Sodor* refers to the Western Islands of Scotland, over which the Bishop of Man had jurisdiction for several centuries. A book, on the history of Man and the Hebrides, recently printed in Norway, is styled "The Chronicle of Man and the *Sudreys*."

Turning now to the islands of Scotland, we may, for the sake of convenience, divide them into four groups. The islands in the Frith of Clyde, the Hebrides or Western Islands; the Orkney Islands, and the Shetland Islands. The total area of these islands is about 4070 square miles.

The Islands in the Frith of Clyde.—These taken together form the county of Bute, and consist of the islands of Bute, Arran, and the two Cumbraes.

Bute.—This island is about 15 miles long and 5 miles broad, and is separated from the coast of Argyleshire by a narrow channel called the Kyles of Bute. The scenery of the island is quiet and beautiful, the climate mild and healthy; so that Bute has been called the Montpellier of Scotland. Agriculture is in an advanced condition; and there is ample means for education provided. Bute was a favourite residence of the kings of Scotland. *Rothesay*, the capital of the island, is the centre of an important herring-fishery. The castle of Rothesay, now a noble ruin, is of great antiquity. *Great* and *Little Cumbray* are two islands which lie midway between the Island of Bute and the coast of Ayrshire. *Millport*, on the south side of the larger island, is pleasantly situated, and is much resorted to in the summer season by the citizens of Glasgow. *Arran* lies to the south of Bute, and is a much larger island. It is 20 miles from north to south, and its breadth is about 10 miles. The whole interior of the island is rugged and mountainous, but especially so towards its northern extremity, where *Goatfell* rises 2900 feet in height. There is not much cultivatable land, but agri-

culture is improved. The island is exceedingly interesting both to the naturalist and the antiquarian. The ptarmigan is occasionally met with on the mountains, and seals are sometimes found on the coast. Here are numerous remains of antiquity, including Druidical circles and Norwegian forts; here Robert Bruce for awhile found shelter; and here Ossian is said to have died. **Brodict** is the chief town on the island. **Lamlash**, further to the south, opposite Holy Isle, is a favourite bathing-place.

The Hebrides or Western Islands.—Properly speaking the term Hebrides is applied to all the western islands of Scotland, including those in the Frith of Clyde; but for the sake of convenience we have restricted the application so as to include those only which lie to the west of the peninsula of Cantire. The Hebrides, taken in this sense, are divided into Inner and Outer Hebrides (p. 145.) This latter group is sometimes called Long Island, and indeed it would seem as if at some remote period it had formed but one island. The group at present includes *Lewis* and *Harris*, which form but a single island, *North Uist*, *Benbecula*, *South Uist*, *Barra*, and many smaller islets. The whole length of this group, from north to south, is 140 miles. About 40 miles further to the west is the small island of *St Kilda*, which is inhabited; and still farther west, about 180 miles from the nearest land, is the little islet of *Rockall*.

The Outer Hebrides are separated from *Skye*, and the mainland by a channel called the Minsh, which in its narrowest portion is 15 or 16 miles across. The largest of the Inner Hebrides is *Skye*, which is covered with mountains, the highest being about 3000 feet. South of *Skye* lies *Mull*, with the adjacent islets of *Iona* and *Staffa*, which have been already noticed (p. 144.) Still further south are *Jura* and *Islay*. *Islay* has been called the "Queen of the Hebrides." The soil is fertile, good crops of wheat are raised, comfortable houses have been built, roads and harbours constructed, and various improvements made. In other parts of the Hebrides, however, agricul-

ture is in a very backward condition. Formerly the inhabitants of these islands were mostly employed in the manufacture of *kelp*, which was formed by burning seaweed, and was largely consumed in the manufacture of glass, soap, and alum. But since the repeal of the duties on salt and barilla, this trade has greatly declined, though the manufacture is still carried on in some of the islands. The chief employment of the population of the Hebrides, at present, consists in the rearing of black cattle and sheep, immense numbers of which are annually exported to the mainland. Formerly the Hebrides were covered with forest; now, however, they are exceedingly bare of trees, except in parts of Skye, Mull, and Islay, where both forest and fruit trees have recently been planted with considerable success.

Manufactures, in the usual sense of the word, are unknown in these islands; people make their own clothes, and a great part of the furniture and utensils which they require. Education is very defective. The language commonly spoken is Gaelic, though English is becoming generally diffused. The introduction of steam-navigation has done much to improve the condition of the inhabitants of these islands.

The climate of the Hebrides is mild and healthy, but variable, tempestuous, and humid. Snow and frost are but little known in any of the islands. The total number of islands is about 200; and of these about 80 are inhabited. The total area of the group is estimated at about 2500 miles; and the population is, perhaps, 100,000. The islands in the Clyde, as we have already mentioned, form the county of Bute: the rest of the Hebrides belong respectively to the counties of Argyle, Inverness, and Ross. The towns, or rather villages, belonging to these islands, are not of any great importance; the two principal ones are Portree and Stornoway. Portree stands on the eastern shore of the Isle of Skye. It has a parish church, a parochial school, and a good harbour, which is regularly visited by Glasgow steamers. Population about 700.

Stornoway is a well built town on the eastern shore of the island of Lewis. The principal trade is in herrings and white fish. Population 2600.

We have already mentioned that for three centuries these islands were subject to the kingdom of Norway. In 1264, they were annexed to the crown of Scotland, and were held by various chieftains in vassalage to the Scottish monarchs. Subsequently, however, all fell into the hands of one chief, who thereupon (1346) assumed the title of "Lord of the Isles," and began to affect an entire independence; and not until the abolition of hereditary jurisdictions, in 1748, was the independence of these chieftains entirely abolished.

The Orkney Islands.—This group lies off the north coast of Scotland, from which it is separated by Pentland Frith, which is about six miles broad. There are about a dozen of the larger islands, of which *Pomona* or *Mainland* is by far the largest; but, if we include every little islet, there are about 67 in all, of which about 40 are uninhabited. None of the islands can be called mountainous except *Hoy*, which rises in one point to the elevation of 1600 feet; and the precipices on the western side of this island, in some places, are 1000 feet in perpendicular height. The climate is humid, but not very cold; the soil, except in some favoured districts, sandy and barren, and agriculture is in a backward condition. Rabbits and fowls are very numerous, and form important articles of export; but the fisheries form the great object of pursuit, and large quantities of herring, cod, and lobsters are annually sent to London. The principal manufacture carried on in these islands is that of straw-plait for ladies' bonnets. Some years ago, about 2000 girls were constantly employed in this occupation. The building of boats, and the making of sails, nets, and cordage, may also be named among the manufactures of the Orkneys. **Kirkwall**, on the eastern side of *Pomona*, is the principal town. Formerly, when it was the residence of the Earls of Orkney, it was a much more considerable place than it

is now. Adjoining the cathedral are the ruins of the Bishop's Palace in which Haco, King of Norway, died. Population about 3500.

The Shetland Islands—together with the Orkneys, from which they are separated by a channel 48 miles wide—form a Scottish county, of which Kirkwall is the capital. They have an area of 880 square miles, which is double that of the Orkneys. The total number of islands belonging to this group is said to exceed 100; but Mainland, the largest, has an area more than equal to all the rest put together. The principal elevation in the group is in the interior of Mainland, where **Roeness Hill** rises nearly 1500 feet above the sea-level. The shores of these islands are in general rugged, especially on the western side, and in the island of *Foula*, which lies to the west of the principal group, the cliffs on the western side rise 1200 feet above the sea. The Orkneys and Shetlands are very similar in natural appearance, but the Shetland group is the more wet and barren of the two. Agriculture is very backward; but the live stock, including horses, cattle, and sheep, though small, are considered valuable. The principal occupation of the people, next to fishing, is knitting; and woollen stockings and gloves, sometimes of extraordinary fineness, are exported. The chief town is **Lerwick**, which stands on the south-eastern shore of Mainland in Bressay Sound. This sound is a great station for the herring-fishery, and many of the inhabitants of Lerwick are engaged in it. The chief exports from the town are fish, butter, hides, rabbit-skins, and stockings. The population exceeds 3000.

The population of the Orkney and Shetlands Islands, taken together, amounts to about 64,000. The people are essentially Norwegians in race; and, although the English language is generally spoken, the Norse origin of the inhabitants is noticeable in their accent, and in many of their words, idioms, customs, and superstitions.

PART II.

PHYSICAL, POLITICAL,
AND
COMMERCIAL GEOGRAPHY,
OF THE
BRITISH ISLANDS.

THE PHYSICAL, POLITICAL, AND COMMERCIAL GEOGRAPHY OF THE COLONIES.

CHAPTER I.

HISTORY OF COLONIZATION. — COLONIES AMONG THE
ANCIENTS.—MODERN COLONIZATION.—THE PORTUGUESE.
—THE SPANIARDS.—THE DUTCH.—THE FRENCH.—
BRITISH COLONIZATION.

THE nations of antiquity, most famous for colonization, were the Phœnicians, Greeks, Carthaginians, and Romans. In modern times the great colonizers have been the Portuguese, Spaniards, Dutch, French, and the English. The Phœnicians, like their descendants the Carthaginians, planted colonies with the view of extending their commerce; and thus we find that, as early as 500 B.C., they had established themselves in Cyprus, Rhodes, on the north and east coasts of Africa, in Sicily, and in Spain; and from these centres an extensive trade was carried on with the countries bordering on the Indian Ocean and Mediterranean Sea; and the shores of France and even Britain (p. 225) were visited. Most of the possessions of the Phœnicians afterwards fell into the hands of the Carthaginians.

The colonies of Greece resembled rather the settlements made on the west coast of Europe by the Sea-kings of the north than colonies as we now understand the term. A number of persons, forming an organized community,

would set out in search of a new home, under some leader who was often either a disappointed politician or a mere adventurer; and when they had settled in some country, they might still acknowledge a kind of dependence upon the parent state, but very often they threw off all allegiance, and asserted their independence. Such were the Grecian colonies founded in Asia Minor, Italy, and in other parts of the Mediterranean.

Rome established colonies for the sake of rewarding her soldiers and securing her conquests. The lands of conquered nations were considered the property of the State, and were parcelled out among the officers of government and the soldiery, or among citizens who had no land in their native country. In this way colonies were established in parts of Asia and Africa, in Germany, Spain, Gaul, and in Britain. Some of these colonies attained to great power and threw off the Roman yoke, others, as was the case with Britain, being deserted by the Roman garrisons, were voluntarily left in the hands of the natives.

In modern times the two events which gave the greatest impulse to colonization were the discovery of America by the Spaniards in 1492, and the passage round the Cape by the Portuguese in 1498. Twenty years after Vasco de Gama had doubled the Cape, the Portuguese had established themselves at Sofala, Mozambique, and Melinda, on the coast of Africa; at Muscat and Ormuz, near the entrance of the Persian Gulf; at Goa, Cochin, and Ceylon; in the Spice islands; and on the coast of China. The Spaniards meantime were extending their conquests on the other side of the globe. Attempts were made to colonize St Domingo, Cuba, Jamaica, and Porto Rico; and Mexico was overrun by Cortes (1519-21). Pizarro and his followers next subjugated Chili, Peru, and Ecuador (1529-35), and Venezuela and New Granada were also added to the dominions of Spain. The chief object of the Spaniards, in all their conquests, was to acquire gold. For this purpose they compelled the natives to work in the mines; shot them like dogs on the least

resistance, and hunted them with bloodhounds when they attempted to escape. This caused a rapid decrease in the number of the native Indians, and African negroes being imported to supply their place, a foundation was laid to the dreadful system of slavery. The Portuguese, also, were to some extent influenced by the love of gold; but they were urged on chiefly by a spirit of adventure, the desire of commerce, and a zeal for spreading the Catholic faith.

Towards the close of the sixteenth century, the Dutch carried on a trade, in East India produce, between Lisbon and the rest of Europe; but on the union of Spain and Portugal, the intercourse of the Dutch with Lisbon was prohibited (1584). The Dutch, being deprived of this important trade, were compelled to seek colonies for themselves. An association was formed called the "Company of Remote Parts," and an expedition sent out to India, 2d April 1595. Batavia, in Java, was built in 1618, and became the capital of the Dutch possessions in the East; a trade was opened up with Japan, and a West India Company formed. The power of the Dutch reached its highest point in the middle of the seventeenth century; Ceylon had been taken from the Portuguese, a colony had been established at the Cape, settlements were made in South America, several of the West India islands had been colonized, and a settlement had also been formed at New York.

It was now that France, emulous of the fame of other nations, began a system of colonization. In the West Indies, Martinique, St Lucia, Grenada, and other islands were purchased from private individuals; and colonists were sent to Cayenne. Canada, Nova Scotia, Louisiana, and other parts of North America were settled, and Pondicherry was established on the Coromandel coast of Hindostan. In the great war with England, however, every foreign possession was lost, but some were restored again in the peace of 1814. Within the present century, France has added Algiers to her other foreign possessions.

The English began to colonize nearly at the same time as the Dutch. In the year 1600, Elizabeth granted the

first charter to the East India Company, and in 1612, the first factory was established at Surat. The progress of the Company was, however, very slow; it was viewed with jealousy by the Dutch and Portuguese, and at the middle of the seventeenth century, the English possessed only Surat, Fort George at Madras, and a few other unimportant factories. Cromwell revived the energies of the Company and supported it against the Dutch; and Charles II., besides presenting it with Bombay and the island of St Helena, granted it a new charter in which not only were all the old privileges renewed, but new and important ones were added. The Company was vested with civil jurisdiction and military authority, and had the power of making peace and war with the "Infidels of India." But even a century after the establishment of the factory at Surat, the Company only possessed a few forts and factories on different parts of the Malabar and Coromandel coasts.

In America, however, colonization had made much more rapid progress. The first permanent English settlement in North America was that of Jamestown, on Chesapeake bay (1607). Sir Humphery Gilbert had attempted to colonize Newfoundland in 1583, and two years later Sir W. Raleigh had taken out a number of colonists to Virginia, but both these attempts failed. In 1620, the "Pilgrim Fathers" landed at New Plymouth and laid the foundation of the New England states. The troubles and discontent in the reigns of James and Charles, though unfavourable to the extension of trade and the progress of the East India Company, promoted a considerable emigration to North America, and hence, New Hampshire, Connecticut, Maryland, and North Carolina were all settled before 1650. Later in the century, South Carolina and Pennsylvania had been colonized; Delaware, New York, and New Jersey had been ceded by the Dutch; Jamaica had been captured from Spain; and the Hudson Bay Company formed (1670). In the meantime several of the West India Islands had been settled, and sugar plantations established.

The wars of the eighteenth century greatly extended the bounds of our colonial empire. Canada was wrested from the French (1759) almost at the same time that the power of France was broken in India and the foundation of our Indian Empire established. Towards the close of the century we lost the United States of North America; but at the conclusion of the long war with France (1815), we had gained British Guiana, the Cape Colony, and the island of Ceylon, from the Dutch; Trinidad had been ceded by Spain; St Lucia, Malta, and the Mauritius, had been given up by France; and Heligoland by Denmark.

In the present century our dominions have been greatly extended in Hindostan; Assam, Aracan, and the Tenasserim Provinces, in Further India, have been added; Malacca has been received from the Dutch in exchange for Bencoolen in the island of Sumatra; and Hong Kong has been ceded to us by the Chinese. In consequence of the overflowing population of this country, emigration has made rapid strides of late years, and several flourishing colonies have been established in Australia, New Zealand, and British Columbia. The last mentioned was erected into a colony in 1858.

The following table will give a concise view of the various foreign possessions of Great Britain, with the date of acquisition, and the area and population of each:—

Name of Colony.	Date.	Area in Square Miles.	Population.
Europe.			
Heligoland	1807	5	2,200
Gibraltar	1704	3	15,500
Malta, Gozo, and Comino .	1800	122	143,000
Asia.			
India (first settlement) . .	1612	1,400,000	189,000,000
Aden	1839	9	50,000
Ceylon	1796	24,000	1,900,000
Further India	1828	100,000	1,200,000
Singapore	1819	830	60,000
Labuan	1846	26	1,000
Hong Kong	1842	80	120,000

Name of Colony.	Date.	Area in Square Miles.	Population.
Africa.			
Gambia and Gold Coast . .	1618	8,000	300,000
Sierra Leone	1787	500	42,000
South Africa	1806	238,000	750,000
St Helena	1673	47	7,000
Mauritius	1810	1,020	310,000
Ascension	1815	34	500
America.			
Hudson's Bay Territory, Nova Scotia, and Newfoundland .	1713	2,550,000	450,000
Canada, Cape Breton, New Brunswick, and Prince Edward Island	1763	380,000	2,900,000
British Columbia	1858	225,000	60,000
Vancouver's Island	1849	14,000	30,000
Bermudas	1609	22	11,000
Honduras	1670	14,000	25,000
British Guiana	1803	76,000	155,000
Falkland Islands	1833	6,000	500
West Indies.			
Barbadoes	1605	166	152,000
St Christopher	1623	68	21,000
Nevis	1628	38	10,000
Bahamas	1629	3,000	35,000
Antigua and Montserrat . .	1632	155	44,000
Jamaica	1655	6,400	441,000
Anguilla and Tortola	1666	56	8,000
Tobago, Grenada, St Vincent, and Dominica	1763	730	104,000
Trinidad	1797	2,020	84,000
St Lucia	1803	215	27,000
Australasia.			
Australia (first settlement) .	1787	3,000,000	1,086,000
Tasmania	1803	24,000	90,000
Norfolk Island	1787	13	270
New Zealand (first settlement)	1839	99,500	165,000
Auckland Isles	1849	187	150

It will appear, on referring to the preceding table, that the total area of the British Colonial Empire exceeds 8,000,000 square miles; and that the population amounts to nearly 200,000,000 persons.

CHAPTER II.

USES OF COLONIES.—BRITISH POSSESSIONS IN EUROPE.

In our hasty sketch of the different colonizing nations of ancient and modern times, we have noticed the various motives which induced different nations to plant colonies. The Greeks sought homes for their overflowing population; the Carthaginians sought to extend their trade and commerce; the Romans sought by colonies to uphold their power and preserve their conquests; the Spaniards sought gold. All these motives—but softened and modified by the pure spirit of Christianity—still urge Britain to uphold her colonial empire. Some of her colonies afford fields for **Emigration**. We have already seen what an overflowing population there is in these islands, and especially in England (p. 179), and however well the soil be tilled, and however numerous are the manufactures, labour cannot be found for all; and hence statesmen have found it one of their imperative duties to find new homes in foreign lands for the surplus population of this country. A great number of emigrants go to the United States, but a large number also go to our colonies, and it is daily becoming more strongly felt that it is for the interest of this country that emigrants should settle in our own colonies rather than in countries not under the rule of Britain. The Cape of Good Hope, Natal, Australia, Tasmania, New Zealand, and British North America, are suitable in every way for English emigrants. The climate in most of these places is very healthy, and, though in some a little warmer, does not differ very much from that of England; while the native population is so scanty, that there is, among those who have already settled, a great demand for labour.

Colonies are also valuable to us on account of their **Natural productions**. The gold mines of Australia and British Columbia are as productive as were the mines of

Mexico and Peru; and from India we obtain not only gold and silver, but pearls and precious stones. But the vegetable and animal productions of our colonies are still more valuable to us than the produce of their mines. The West and East Indies and Western Africa furnish us with all the produce of the tropics, and North America is rich in forests, fisheries, and peltry. But in no way are the productions of our colonies so important as in supplying us with the raw material for our manufactures. We have already mentioned the amount of capital expended, and the number of persons employed in the cotton trade. The raw material for this manufacture came, until lately, almost entirely from the United States; and in the unsettled state of that country we have been reminded how much we depend upon it for giving employment to half a million of our population. If cotton were cultivated in our colonies, we could raise sufficient to make us independent of the supplies from America; and it may be grown, as is well known, in Natal, India, parts of Australia, British Guiana, and in the West Indies. Our colonies already supply two-thirds of the raw material used in our woollen manufacture; and flax, jute, and hemp for our linen manufacture are supplied from India and New Zealand. Hides also, for leather, are imported from India and the Cape of Good Hope.

But not only might our colonies supply us with almost all the raw material needed for our manufactures, they are also our best **markets** for our manufactured goods. We have already mentioned that they take one-third of the total exports from this country, and this quantity is constantly increasing. When the resources of India are properly developed, and the country has become richer, the imports from Great Britain will no doubt be increased tenfold.

Lastly, there are other of our possessions which afford no facilities as fields for emigration, and are too small to be of much value either as fields for production or as **markets** for our manufactured goods, but yet are of great

importance on account of their position. Heligoland was used as a military depôt during the great war with Napoleon. Gibraltar commands the entrance into the Mediterranean, as Aden does the Red Sea, and Singapore the Eastern Archipelago. Malta is a place of shelter and protection for our ships in the Mediterranean; Hong Kong is the depôt for our trade with China. Our settlements in Western Africa help us to put down the slave trade. St Helena is a place of call for ships coming from India or the Cape, and the Falkland Isles are resting-places for ships engaged in the southern whale-fishery.

The British possessions in Europe, exclusive of the British Islands, are Heligoland, Gibraltar, Malta, Gozo, and Comino.

Heligoland.—This small island, which has an area of about five miles, is situated about 36 miles from the mouths of the Elbe and Weser. It consists of two parts, a rocky cliff which is crowned with a lighthouse, and on which is a small town containing about 400 families,—and a low sandy plain, connected with the cliff by a ridge of rock which is cut into 190 steps. The male inhabitants of the island are chiefly engaged in the haddock and lobster fisheries, or in acting as pilots for vessels entering the Elbe: the females are employed in raising scanty crops of oats and barley. The total population of the island is about 2200. In ancient times this island was the seat of the Saxon goddess Phoseta, and hence derived its name Heligoland (Holy Land). It was in possession of the Danes until 1807, when it was taken by England, and was confirmed to this country at the peace of 1814. During the blockade of Europe, established by Napoleon, it was a great depôt for English manufactured goods, which were afterwards smuggled on to the Continent; but since the peace of 1815 it has not been of much importance.

Gibraltar.—The fortress of Gibraltar stands upon a rocky peninsula about three miles long and nearly three-quarters of a mile broad, which is connected with the

mainland by a low sandy neck of land about a mile and a half in length, and terminates on the south in Europa Point. The whole peninsula forms a mass of grey rock, inaccessible on the north and east, and nearly so on the south; on the west, where it slopes down to Gibraltar Bay, it is protected by formidable batteries which render the fortress impregnable. The east side is also defended, and on the summit of the rock are barracks and fortresses. The total number of guns mounted on different parts of the rock is said to be not less than a thousand.

The climate of Gibraltar is warm and temperate, the heat of summer being modified by cooling sea-breezes. Acacia, fig, and orange trees grow freely; and rabbits, woodcocks, and partridges abound. There is also a species of monkey without tails, of a dark fawn colour.

The town of *Gibraltar* lies on the north-west side of the rock, and fronts the bay. It consists principally of one street nearly a mile in length, well built and lighted. The roofs of the houses are so constructed as to receive the falling rain, which is conducted to a tank beneath with which every house is provided. The town and garrison is thus supplied with water, for there are no springs on the rock. The population is about 15,500, of which about 4000 only are females. The strength of the garrison is generally between 3000 and 4000 strong. The bay of Gibraltar is spacious and well adapted to shipping, being protected from the more dangerous winds. On the west side of the bay stands the Spanish town of Algesiras. Gibraltar was at one time the centre of considerable trade, being a depôt for English and American goods which were afterwards sent into Africa and different parts of the Mediterranean; but its commercial importance is not so great as formerly. In 1862, it imported British and Irish produce and manufactures to the amount of about £1,000,000. Its political advantages, however, are very great. It is the key to the Mediterranean, as the strait which it commands is only 15 miles wide in its narrowest part; and thus in time of war it can not only

annoy the enemy's shipping, but protect our own trade and commerce in the Mediterranean.

In ancient times the rock of Gibraltar, under the name of Calpe, and Mount Abyla on the opposite coast of Africa, were called the *Pillars of Hercules*, and were looked upon by the dwellers to the east as the western boundary of the world. It derives its present name (a corruption of *Jebel-tarik*—the hill of *Tarik*) from a Moorish leader who took possession of it in 711. It was taken from the Moors by Ferdinand, King of Castile, in the fifteenth century. After being re-captured, it was again taken by Spain a century later, and remained in possession of that country until 1704, when it was taken by Sir G. Rooke. Since that time it has been repeatedly besieged, and the last time the siege, which was conducted by the French and Spanish fleets, lasted three years and seven months—from 1779 to 1783. But the besiegers were defeated with great loss by the garrison, under their commander General Elliott.

Malta.—The islands of Malta, Gozo, and Comino, form together a British colony. Malta lies about 60 miles south of Sicily, and about 200 miles from the coast of Africa. It is an irregular oval in shape, with deeply indented shores, except on the south; and it possesses an area of 95 square miles. The surface is very irregular, and in the south-west rises to an elevation of 1200 feet, whence it slopes down to the north-east. The island is naturally very barren, but great pains have been bestowed upon its cultivation, and formerly soil was brought from Gozo and even Sicily. There are no lakes or streams on the island, but springs are numerous; and, as the rain is collected in cisterns, there is no want of water. The climate is very hot in summer, but in winter, and especially from October to January, it is delightful. The staple product of Malta is cotton; and fruits, particularly figs and oranges, are numerous. Corn is grown, but not sufficient to support the inhabitants, and it is imported from Italy and the Black Sea. The olive and the vine are cultivated, but they are of inferior quality; and olive oil is

imported from Italy, and wine from Naples and Sicily. The manufactures consist chiefly of cotton goods, cabinet-work, jewellery, and filigree work.

Malta was first colonized by the Phœnicians, and from them it passed successively through the hands of the Greeks, Carthaginians, and Romans. On the downfall of the Roman Empire it fell into the hands of the Goths and Vandals, and ultimately into the possession of the Saracens. It was next annexed to Sicily, and at length came into the hands of Charles V., who presented it to the Knights of St John (1525). It continued in possession of that Order until near the close of the last century, when it was delivered up by the Grand Master into the hands of Napoleon. It was afterwards blockaded by Nelson for two years, when the French were compelled to surrender, 4th September 1800; and it was definitely annexed to England at the treaty of Paris, 1814.

The present population is about 125,000. The Maltese are of a dark race, strong and active. The men make excellent sailors, and are noted all over the Mediterranean for their skill and intrepidity. The morals of all classes are much higher than in most parts of the south of Europe. The language commonly spoken is Italian, but the native Maltese have a peculiar dialect of their own. The national religion is Roman-catholic, to which the people are strongly attached. Malta is very important as a station both in time of peace and war. It is convenient as a centre of trade, from which articles of British manufacture can be spread over the Mediterranean. In 1862, the imports of Malta and Gozo from Great Britain amounted to £433,000. It is also an important naval station, where merchant-ships and men-of-war can be repaired and accommodated.

The chief towns in Malta are Valetta and Citta Vecchia. **Valetta**, the capital of the island, was built in 1566. It has an imposing situation, standing in the centre of a fine double harbour, and is strongly fortified. The streets, though steep, are wide and well paved, and there

are some noble squares, and fine public buildings. The mail steamers for Alexandria, Constantinople, and the Levant generally, call here regularly. *Citta Vecchia*, a town in the interior of the island, about seven miles from Valetta, was the former capital, but is now greatly decayed. The Cathedral, dedicated to St Paul, is said to occupy the site of the house of Publius, who was the Roman governor when the apostle suffered shipwreck. A small harbour on the northern coast—Porto de San Paolo, or Harbour of St Paul—is supposed to have been the scene of the shipwreck.

Gozo lies to the north-west of Malta, from which it is separated by a channel four miles wide, in which lies the small island of *Comino*. It is nine miles long, five broad, and has an area of about twenty-five miles. The soil is thin, but of great fertility, and much grain and fruits are raised; but, as in Malta, the principal crop is cotton. There is an alabaster quarry in the north-west of the island, and on the south side are salt-works. The town of *Gozo* has a population of about 2000, and there are several villages. The total population of the island is about 15,000. *Comino* is about two miles long, and a mile and a half broad. Its coast is much indented, and its surface hilly.

The *Ionian Islands*, in 1815, were constituted a republic, and placed under the protection of Great Britain; but they have quite recently been annexed to the kingdom of Greece.

CHAPTER III.

HINDOSTAN. — SURFACE AND MINERALS. — CLIMATE. —
RIVERS.—VEGETABLE PRODUCTIONS.—ANIMALS.

Hindustan is the second of the three peninsulas that appear on the south coast of Asia. In shape it is an immense triangle, of which the Himalaya Mountains form

the base, and Cape Comorin the apex. The extreme length from north to south is about 1860 miles, and the greatest breadth, from the Solyman Mountains to the banks of the Brahmapootra, is about 1500 miles. Its area is nearly 1,400,000 miles, and the length of its coast line is about 3600 miles.

Surface and Minerals.—The great chain of the Himalayas is the loftiest range of mountains in the world. The average height of the chain varies from 15,000 to 18,000 feet, but many peaks exceed 20,000 feet. **Mount Everest**, the culminating point of the range, has an elevation of 29,000 feet; and the summits of **Kunchin-jinga** and **Dhawalagiri** are not much less in height. The length of the whole chain, from east to west, is about 1500 miles, and the breadth varies from 200 to 250 miles. A range of lower hills of sandstone, with an average elevation of 3000 feet, runs along the base of the main chain. Below this again is a narrow belt of dry forest-land, which separates the mountains from the belt of swamp called the Tarai, which lies at their foot. To the south of this unhealthy tract extends the great plain of Hindostan.

The *Plain of Hindostan* extends from the Himalayas to a ridge of mountains running eastward from the Gulf of Cambay, called the **Vindhya range**; and from the Bay of Bengal to the borders of Beloochistan and Afghanistan. It is divided into two portions by the **Aravulli Mountains**, which run north-eastward from the western extremity of the Vindhya range. To the eastward is the plain of the Ganges, which rises towards the south-west; to the west is the plain of the Indus, which includes the *Great Indian Desert*. This desert extends from the lower course of the Indus to the Aravulli Mountains, and from the southern confines of the Punjaub to the Runn of Cutch, and embraces an area of 150,000 miles. It contains several oases, and is separated from the River Indus by a fertile tract of land ten or fifteen miles in width. The southern part of the desert, however, spreads over the

delta of the Indus, and, stretching into Beloochistan, is connected with that belt of sandy wastes which extends from Central Africa into the interior of Asia. The remaining portions of the Plain of Hindostan, and the valley of the Ganges especially, are of great fertility.

Returning now to the Vindhya range, we find that it forms the base of another triangle, of which the Eastern and Western Ghauts, which run parallel to the shores of Hindostan, form the sides. This triangle includes the table-land called the *Deccan*, and at the apex of the triangle is the small plateau of *Mysore*, surrounded by the *Neilgherries*. The mean elevation of the Deccan is 2000 feet, and the surface consists of plains crossed with low rocky ridges, and interspersed with insulated, round-topped hills, many of which are fortified. The plateau of Mysore has an elevation of about 4000 feet, and the Neilgherries rise about 3000 feet higher.

The Eastern and Western Ghauts differ very much from each other in character. The Western Ghauts extend in a continuous chain—with one single break—from Cape Comorin to the Gulf of Cambay, nearly parallel with the coast, and at a distance rarely exceeding fifty miles. This range varies very much in altitude, but the highest summits are said to exceed 6000 feet. Forests of teak and other timber clothe the hills to their summits, the scenery is frequently very picturesque, and beautiful waterfalls are often met with. The Eastern Ghauts commence to the north of the river Cauvery, at some distance from Cape Comorin. The chain is often broken, and nowhere exceeds 3000 feet in height. It is, however, four times the breadth of the Western Ghauts, but possesses none of their picturesque scenery. The surface of the hills is barren and stony, and almost destitute of trees. The opposite coasts of Hindostan also differ as much as the mountain-chains which border them. The eastern or *Coromandel coast* is destitute of good harbours, and exposed to a powerful surf, while the wide maritime plains are for the most part parched. The western or *Malabar*

coast is broken and rocky ; it contains many good harbours, and in several parts is well cultivated.

The south-western corner of the plain of the Ganges has an elevation of about 2000 feet, and is generally known as the *Plateau of Malwa*. A short range of low hills, running parallel to the Vindhya range, and separated from it by the River Nerbudda, is known as the **Saunpoora range**. To the south of the Neilgherries there is a break in the Western Ghauts, and a plain 20 miles wide extends from the east to the west coast : this is called the *Gap of Coimbatore*.

The minerals of Hindostan are varied and abundant, but have scarcely as yet been turned to account. Numerous precious stones, including diamonds, rubies, garnets, amethysts, jasper, agate, and opal are found in various parts. *Diamonds* are abundant at Punnah, in Bundelcund, and *gold* and *silver* are found in Mysore. Beds of *coal* stretch right across India, from the district of Cutch to the eastern extremity of Assam, and the mines of Runegunge, about 100 miles to the north-west of Calcutta, are especially valuable. *Iron-ore* is very widely diffused, and is frequently associated with coal. It is found in the Himalayas, in Bengal, in the valley of the Nerbudda, and on the Malabar coast. In the last-mentioned district it is worked by an English company, and the iron is exported to England. *Nitre* is obtained from the soil in various parts of Hindostan, and forms an important article of export ; valuable beds of *salt* are also found in the basin of the Ganges, in the Punjab, and in the Aravulli range. *Marbles* and *building-stones* everywhere abound, and there are several valuable earths and clays.

Climate.—Hindostan lies between the parallels of 8° and 37° north latitude, and the greater part of it therefore lies within the tropics. We have already remarked that the isotherm of 80° passes through Northern India (p. 72), and in some parts of the Coromandel coast the mean annual temperature is still higher. All the various causes

which modify climate are felt in Hindostan. The low plains of the Carnatic, on the east coast, and the sandy desert of Northern India, are the hottest parts; while the table-lands and the elevated regions of the Ghauts and Neilgherries enjoy a temperate climate, suitable to Europeans.

The Monsoons (p. 50) blow alternately from the north-east and south-west quarters of the heavens. The south-west monsoon, blowing over a great expanse of water, brings those abundant showers which fertilize the Malabar coast; while the north-east monsoon, coming over land for the most part, is a comparatively dry wind. Influenced by these winds, the climate of Hindostan may be divided into three seasons—the hot season, from March to June; the wet season, from June to October; and the comparatively cold season, from October to March. The quantity of rain which falls annually in India is very great, and we have already mentioned that 600 inches have been known to fall at the foot of the Khasia Mountains, in Bengal (p. 53).

Rivers.—In Northern India, or Hindostan proper, there are three large rivers which rise at no great distance from each other—the Ganges, the Indus, and the Brahmapootra. Besides these, there are six other rivers of some importance that drain the southern part of Hindostan. These are the Mahanuddy, the Godavery, the Kistnah, the Cauvery, the Taptee, and the Nerbudda. Four of these empty themselves into the Bay of Bengal, and only two have their outlets on the opposite coast. This we can easily understand, when we recollect that the Western Ghauts are higher, more continuous, and better watered than the mountains on the Coromandel coast; and, therefore, while they are well adapted for giving rise to rivers, they afford no outlet to the streams themselves. There are no *lakes* of any importance in Hindostan.

The Ganges rises on the southern slope of the Himalayas, at an elevation of 1400 feet. It flows for some distance among the mountains, and, having entered the

Plain of Hindostan at *Hurdwar*, flows south-east to *Allahabad*, where it is joined by the *Jumna*. This feeder rises also in the Himalayas, and flowing south-east past *Delhi* and *Agra*, it is augmented by the waters of the *Chumbul*, which rises in the Vindhya Mountains. The *Jumna* is altogether about 860 miles long; its banks are often lofty and precipitous, and its current strong. Below *Allahabad*, where the river becomes navigable for steamers, the Ganges flows to the east, passing the towns of *Benares* and *Patna*, and receiving as affluents the *Goomtee*, *Gogra*, and *Gunduck* on the left bank, and the *Sone* on the right. At *Rajmahal* the river turns again to the south-west, and empties itself by a delta into the Bay of Bengal. The delta commences about 200 miles from the sea: the part bordering the sea is called the *Sunderbunds*, and is a tract covered with jungle, and inhabited by tigers and crocodiles. Of the numerous streams which form the delta, the *Hooghly*, on which *Calcutta* is built, is the most important. The total length of the Ganges is about 1500 miles; and the area of its basin is 400,000 square miles. The valley of the Ganges is the most fertile and most thickly peopled part of Hindostan.

The *Indus* rises in the northern slope of the Himalayas, at an elevation of 18,000 feet. It flows at first north-west, past the important town of *Leh*, in Middle Thibet, and through lofty barren plains or deep mountain-gorges. It then breaks through the mountains, and flows south-west into the Arabian Sea. At *Attock* it is joined by the *Cabul*, which comes from Afghanistan; and further south it is joined by the *Punjunud*, which brings with it the waters of five rivers—*Sutlej*, *Baas*, *Ravee*, *Chenaub*, and *Jelum*. The district drained by these five rivers is called the *Punjaub*. Like the Ganges, the *Indus* forms a delta which is about 130 miles in length and the same in breadth. The total length of the river is about 1800 miles. The navigation of the *Indus* is much impeded by shallows and sandbanks; but a steam flotilla, consisting of flat-bottomed boats, has been built expressly for the navigation of

the river between Hyderabad and Mooltan, which stands on the Chenaub. A railway has been commenced between *Kurrachee* and *Hyderabad*, and another from *Mooltan* to *Lahore* and *Amritsir*, towns on the Ravee.

The Brahmapootra, under the name of **Sanpoo**, rises on the northern slope of the Himalayas, not far from the Indus, and nearly opposite to the source of the Ganges. It flows at first in an easterly direction, parallel to the Himalayas, for about 750 miles, and then, breaking through the mountains, turns south-west through the middle of Assam. It then makes a sudden bend to the south, and mingling its waters with those of the Ganges, empties itself into the Bay of Bengal. Its total length is about 1400 miles, and the area of its basin is about 300,000. For 60 miles from its mouth it is about four or five miles wide, and contains numerous islands and sandbanks. Like the Ganges, it overflows its banks in summer, and Upper Assam and the eastern portions of Bengal are then one sheet of water.

The Mahanuddy rises in the north-western corner of the Deccan, and after a course of about 500 miles, falls into the sea below *Cuttack*. Diamonds of the finest quality, and of various sizes, are found in its valley. The **Godavery** rises near the northern extremity of the Western Ghats, at about 50 miles from the sea. It flows across the peninsula in a south-east direction, and enters the sea by several mouths, after a course of about 900 miles. The forests along the banks of this river contain excellent timber for shipbuilding. The **Kistnah** rises at *Mahabaleshwar* (p. 53), only 40 miles from the west coast, and flows at first south-east. It is then joined by the **Tongabudra**; after which, it flows eastward, and, after a course of about 800 miles, enters the sea. It is said to be richer in gems than any other river in Hindostan. The **Cauvery** rises in the Western Ghats, and, after a course of about 450 miles through Mysore, Coimbatore, and the Lower Carnatic, falls into the Bay of Bengal by numerous mouths. The **Taptee** flows along the southern base of the Sautpoora

Mountains, and, after a course of 460 miles, enters the Gulf of Cambay, 20 miles below *Surat*. The **Nerbudda** rises not far from the Mahanuddy, and flows in a general direction to the west, between the Sautpoora and Vindhya Mountains. Its current is obstructed by shallows, rocks, and cataracts, and its banks are clothed with dense jungle. After a course of about 800 miles it empties itself into the Gulf of Cambay.

Vegetable and Animal Productions.—The forests of Hindostan contain an immense variety of trees, of which the names even are scarcely known in Europe. **Teak**, so useful in shipbuilding, has been already mentioned in connexion with the Western Ghauts; there are also large forests of **Bamboo**, and numerous flowering shrubs. Perhaps the most remarkable tree in India is the **Banyan**. It grows to a great height, and its branches throw down shoots which take root, and themselves become new trunks. One single tree will thus spread over an immense area, and it is said that on an island in the Nerbudda there is a tree which covers four acres. **Cocoa** and other palms also abound, and afford food to the inhabitants; and the finest fruits, such as the mango, the pomegranate, citron, date, almond, grape, pineapple, and tamarind, are indigenous. Other vegetables will be mentioned when we come to speak of the agriculture and commerce of Hindostan.

The wild animals of Hindostan are too well known to need especial mention. The tiger is lord of the jungles; the lion is confined to the north-west of India; the leopard, panther, hyæna, wolf, bear, lynx, jackal, and numerous apes are all natives of this country. The elephant, buffalo, and dromedary have become domesticated. The rhinoceros is met with in the forests at the foot of the Himalayas, and near the Sunderbunds. The stag, elk, and antelope abound. Crocodiles are common in all the great rivers; reptiles are numerous. A large species of heron, called the **Adjutant** bird, frequents the towns of Bengal, and is of great service in destroying reptiles, and in clearing the streets of refuse.

CHAPTER IV.

POLITICAL GEOGRAPHY OF HINDOSTAN :— HISTORY.—
PRESENT POLITICAL CONDITION.— GOVERNMENT AND
REVENUE.— INDUSTRIAL PURSUITS.— FUTURE PROS-
PECTS.

History.—Hindostan seems to have been peopled originally by a number of black tribes, of which the Bheels, Coolies, Gonds, etc., still numbering between two and three millions, are the remnants. These aborigines,—who are found at present dwelling among the hills which border the Deccan,—were conquered by a white race belonging to the Indo-European branch of the Caucasian type (p. 87.) The invaders were divided into three *castes*—the Brahmins or priests, the warriors, and the merchants; the enslaved race made a fourth—the labourers. Each of these castes has split up into a number of subdivisions, so that at present there are, it is said, at least 200 castes in India; and, as a rule, one caste may not marry, eat, or associate with another.

The modern history of Hindostan commences with A.D. 1000, when Mahmoud, a Mohammedan sovereign, made the first of thirteen successful expeditions into India. In 1206, an Afghan dynasty was established at Delhi, and lasted for three centuries. In 1525, Baber invaded Hindostan, and established the Mogul dynasty. Under Akbar, who reigned from 1556–1605, the Mogul empire reached its greatest extent. Shah Jehan, his grandson, is celebrated for the magnificent architectural remains he has left behind him; and we may mention, in particular, the Mausoleum, at Agra, which is said to have cost £3,000,000 sterling. Aurungzebe, the third son of Shah Jehan, came to the throne in 1658. Under him the Empire began to show symptoms of decay. Several tribes of Hindoos revolted. The Mahrattas, a powerful tribe, dwelling south of the Nerbudda, maintained a successful struggle;

and the Rajpoots, who inhabited the country between the Nerbudda and Jumna, were only subdued after some years of hard fighting. After the death of Aurungzebe, all was confusion. The Mahrattas still continued fighting; and the Sikhs, a formidable tribe, dwelling in the neighbourhood of Lahore, revolted; and Nadir Shah, King of Persia, taking advantage of the unsettled state of the country, invaded India, took Delhi, and after remaining there two months, returned to Persia with immense spoil (1738).

And now all was anarchy: tribes everywhere threw off the authority of the Emperor, who was too weak to reduce them to obedience. At this time, as we have previously stated, the English had not much power in India; but it soon became evident that they must take a part in the struggles among the native powers, if it were only to preserve the little patches of territory they already possessed. Their general policy was to support the Emperor, or Great Mogul as he was called, against the revolted tribes; but, in some cases, native princes, too powerful to be subdued, were raised to the royal dignity, and thus became powerful allies to the English. But the French also had, at this time, forts and factories in Hindostan, and the princes of India became involved in the wars which broke out between the European powers. And now it was that Clive, not only destroyed the power of the French in the East, but also laid the foundation of our Indian Empire (1750-65).

Towards the close of the eighteenth century, commenced the war with Hyder Ali, which was continued by his successor Tippoo, and ended with the taking of Seringapatam (1799), when a great portion of Southern India came under British rule. The commencement of the present century was marked by the wars with the Mahrattas, and a considerable accession of territory in Northern India; the Great Mogul was now taken under the protection of the British power, and pensioned. In 1843, Scinde, which embraces the lower course of the Indus, was annexed; and six years later, the Punjaub was

added. Oude was annexed to British rule in 1856; and in the year following, the Sepoy Mutiny broke out, which was not put down until 1859. The Great Mogul was deposed for taking part in this rebellion, and sentenced to be transported for life.

Present Political Condition.—At present only three small states in Hindostan retain their independence—Cashmere, Nepaul, and Bhotan: all three lie among the valleys of the Himalayas. A large portion of India is still governed by native princes who are under the protection of Britain, while the remaining districts, including three-fifths of the whole peninsula, are under the direct influence of the British crown. The most important of the protected territories are Rajpootana, the Mahratta States, the Nizam's Dominions, Mysore, Cochin and Travancore, Cutch, and parts of Orissa.

Rajpootana is a large district extending from the Sutlej to the Chumbul, and includes the Great Indian Desert and the Aravulli mountains. It comprises a number of smaller states, each governed by a Rajah. The Mahratta states include Guzerat, Gwalior, Indore, and some smaller territories. **Guzerat** includes nearly the whole peninsula of Kattiwar which lies between the gulfs of Cutch and Cambay. **Gwalior** consists of a large district of irregular shape stretching from the gulf of Cambay to the Jumna, and including the greater part of the plateau of Malwa. The capital of this territory is *Gwalior*, a strongly fortified town. **Indore** extends over the middle course of the Nerbudda, and embraces a small part of Malwa.

The **Nizam's Dominions** form the most considerable of all the protected states, and lie between the Godavery and Kistnah. The chief town, *Hyderabad*, stands on a tributary of the Kistnah. **Mysore** embraces the plateau of that name. **Cochin** and **Travancore** are contiguous states in the extreme south-west of the peninsula; the town of *Cochin* belongs to Great Britain, but the territory is governed by a native rajah. **Cutch** embraces the penin-

sula of the same name, and is governed by a sovereign named the Rao. The province of **Orissa** lies to the south-west of Bengal: the district along the coast known as *Cuttack*, belongs to the Bengal Presidency; but the interior of the province, which is inhabited by various wild tribes, is in a great measure independent.

The remaining portion of Hindostan belongs to Great Britain, and is, for the purposes of government, divided into the three Presidencies of Bengal, Madras, and Bombay. The states in the upper part of the valley of the Ganges are called the *North-west Provinces*, and are under a Lieutenant-Governor; the Punjaub, and Oude, as well as Berar, a large district lying between the Mahanuddy and Godavery, are also connected with the Presidency of Bengal. The Madras Presidency includes that part of India south of the Kistnah and its feeder the Tongabudra, except the protected states, and also the coast region of the Circars. The Bombay Presidency includes nearly all that part of the Deccan which lies north of the Tongabudra and west of the Nizam's Dominions, a belt of land round the gulf of Cambay, and the province of Scinde.

The present population of Hindostan is about 180,000,000. Of this number about four-fifths are Hindoos, and worshippers of Brahma. Next in number to the Hindoos are the Mohammedans, who number about 15,000,000. Both the Hindoos and Mohammedans belong to the Caucasian division of the human race; the aborigines of India, however, would seem to belong to the Mongolian type. In the neighbourhood of Bombay there are about 150,000 Parsees or Fire-worshippers, descendants of Persians, who have fled into India from the persecution of the Mohammedans. Christianity has been introduced into India, and there is a bishopric established in each of the three Presidencies, and about 150,000 natives have become Christians.

Government and Revenue.—We have already alluded to the formation of the East India Company (p. 238). After the successes of Clive, it soon became evident that

the possessions of the Company in the East had become too large to be left in the hands of private individuals. Accordingly, in 1784, Mr Pitt introduced into Parliament his famous India Bill, which established the Board of Control. Since that time the privileges of the Company, both political and commercial, have gradually been curtailed. In 1833, the monopoly of the trade was taken away, and Europeans were allowed to trade with any part of India without a license. In 1853, the appointments to the Civil Service were taken out of the hands of the Company, and thrown open to competitive examination; and at length, in 1858, the whole administration of our Indian Empire was transferred to the Crown. The government of India is now in the hands of the Secretary of State for India, who is assisted by a council of fifteen members, the majority of whom must have resided ten years in that country. The governors of the three Presidencies are appointed by the Crown, and the governor of Bengal is the Governor-general of India. He has the power to make war and declare peace, and can enter into treaties of commerce and alliance. In conjunction with his council he also can make laws for the internal government of the country, and these laws have force throughout British India. Under the Governor-general, besides the governors of the other two Presidencies, are the lieutenant-governor of the North-west Provinces and the commissioners of Oude and the Punjaub. The Governor-general himself is subject to the Indian Council.

For several years the expenditure of India has exceeded the income, and there is now a large Indian debt, amounting to upwards of £40,000,000. The principal source of revenue is the land-tax; for in India, as in most oriental countries, the land belongs to the government, and the tax is in the place of rent. Besides the land-tax, the revenue is made up by taxes on salt and opium, certain import and export duties, and an income-tax. The whole income thus raised for the year ending 30th April 1864, is estimated at £45,000,000; and this, owing to judicious

retrenchment, will probably leave a small surplus. But we cannot help noticing that a country ten times the size of the British Islands, and which has a population at least six times as numerous, can only raise about one-half the revenue. It is evident that the natural resources of India cannot, as yet, be fully developed, and to this subject we next direct our attention.

Industrial Pursuits.—The arts in which the Hindoos have made the greatest progress are agriculture, weaving, dyeing, and architecture; but agriculture forms the chief employment of the people. With some few exceptions, the soil of Hindostan is everywhere suitable to some valuable crop; but vast tracts of land yet remain uncultivated, and what little cultivation there is, is of the most imperfect description. The overflow of the rivers is a great means of irrigating the land, and the waters are preserved by the aid of tanks, which are very numerous in cultivated districts. The native ox and buffalo are used for the plough; the elephant, camel, horse, and ass are the beasts of burden. The principal articles cultivated are rice, indigo, opium, the cotton plant, and the mulberry tree.

Rice is grown in all parts of India on the banks of rivers, and near their mouths; the valley and delta of the Ganges are especially productive. Rice forms an important article of food to the people of India, but not to such an extent as is generally supposed; and a great portion of that grown in Bengal is exported. **Indigo** is an important article of commerce. It grows throughout the whole valley of the Ganges from Dacca to Delhi, and is cultivated also to some extent in Candeish in the Bombay Presidency. India almost entirely supplies the whole of Europe with this article. The cultivation of **Opium** is a government monopoly, and forms a considerable source of revenue. It is grown only in the provinces of Bahar and Benares in British territories, and is raised also in the Indore territories. The produce of the crop is valued at £4,000,000, and is chiefly exported to China.

Cotton is indigenous to India, and grows chiefly in the uplands of the west and south. Coimbatore and Mysore are famous for their crops, as are also Guzerat and Scinde. A great quantity of the cotton grown in India is consumed in the native manufactures; but there is still left an immense quantity for export, if it could only be brought conveniently to the coast. At present it is inferior to the cotton of America in length of staple, but with proper attention, cotton of a superior quality might be raised. In 1861, the total quantity of cotton imported from India exceeded 3,000,000 cwts.; and **Shedashegur**, on the Malabar coast, is an important port for the export of this article. The **Mulberry** thrives freely in India, and its culture might be greatly extended. It is produced chiefly in Bengal and Assam: the silk of the latter province being especially fine. Sugar, coffee, and tea might be successfully cultivated in India, and, indeed, are raised to some extent. Hemp, flax, and jute are also exported in considerable quantities, as is pepper also, which is grown largely on the Malabar coast. The chinchona tree has been introduced into the Neilgherries, and about 50,000 plants are now flourishing there.

The most important manufactures among the Hindoos are cotton and silk fabrics and shawls. The best *cotton* goods are made at Masulipatam on the Coromandel coast; diapers are produced at Dacca, and chintz at Calcutta and Burdwan. India is now, however, supplied in a great measure with cottons from England; and the produce of the native manufacture is sent to Arabia, Persia, and the Indian Archipelago. The *silks* of Amritsir, Lahore, and Mooltan, in the Punjaub, and of Moorshedabad in Bengal, have long been celebrated; but they are inferior to the fabrics of China. The *shawls* are chiefly made in Cashmere from the wool of the Thibet goat. *Embroidery* with gold and silver thread is carried on at Dacca, in different parts of the Punjaub, and in Scinde. Trichinopoly is noted for its trinkets; and at the Great Exhibition of 1851 there were *mirrors* from Lahore, and *carpets* from Bangalore.

The commerce of Hindostan, notwithstanding the undeveloped state of its resources, is very considerable. It trades with Great Britain, China, the Indian Archipelago, Arabia, and Persia; and by means of caravans it has communication with Central Asia. The trade of India with Central Asia amounts to about £1,000,000 sterling, and about 2000 camel-loads of goods reach Cabul yearly. The chief articles of export to Great Britain are cotton, wool, hemp, jute, hides, silk, indigo, saltpetre, and teak; besides rice, sugar, coffee, tea, pepper, oils, gums, perfumes, and spices. The imports are chiefly manufactured goods from England; and ale, beer, books, and furniture for the English residents. The value of the imports of British manufactures and produce into India for the year 1862 was about £14,500,000; and the total exports, exclusive of Singapore and Ceylon, was above £34,000,000.

Future Prospects.—When we reflect on the size and natural advantages of Hindostan as compared with Great Britain, and then compare the difference in revenue and commerce of the two countries, we cannot fail to see that the natural resources of India are far from being properly developed. In order that this may be accomplished, two things are necessary,—1. An infusion of European skill and capital. 2. Improved means of internal communication. Agriculture will ever form the great strength of India; but agriculture is despised among the Hindoos, and is considered as an occupation suitable for slaves only. The consequence is that it is left to the most ignorant class, whose labour is far inferior to that of Europeans, or even Chinese; and besides, the poor ryots—as the cultivators are called—are destitute of capital. In some few cases European capital has been introduced. Previous to the late indigo riots, European agency was spending upwards of £1,000,000 annually in Lower Bengal in the cultivation of indigo; and that this has been a profitable speculation is shown in the eagerness with which the proprietors wish to compel the ryots to grow indigo instead of flax or hemp. Again, it appears from

evidence given before a Select Committee of Parliament in 1858, that coffee of the finest quality has been raised in the Neilgherries, and English capitalists have there realized profits of 100 per cent. The committee in their report stated that the settlement of Europeans in India had everywhere been attended with beneficial results, and suggested the removal of "all impediments which may exist to the settlement of men of capital, who may be inclined to invest their money in the development of the vast agricultural capabilities and mineral resources of India." And very recently a company has been formed in Manchester for promoting the growth of cotton in India and some other of our colonies.

Of the necessity of improved means of communication in India there can be no doubt. The rivers, as we have already seen, though large, are not well suited to navigation; and under the old native government India had not a single road properly so called. Much has been done, however, in the present century in the way of roads, canals, and railways.

We have already mentioned the works in progress in the basin of the Indus (p. 252). A good road has also been constructed from Calcutta to Peshawur, a distance of 1500 miles; and besides this there are more than 2000 miles of good macadamized road either completed or in course of construction in other parts of India. The Ganges canal, as a means of communication, is especially worthy of notice. It commences at Hurdwar, and is to extend, for a distance of 180 miles, to Alighur. Here it will diverge into two channels, one going to Cawnpore, and the other joining the Jumna near Humeerpoor. It is navigable throughout, and will also irrigate a tract of country 8400 miles in area. Besides roads and canals, 4000 miles of railway are now in course of construction. A line is to run from Calcutta to Lahore, on the Ravee: another will branch off at Mirzapore and run to Bombay. From Bombay a line will cross the peninsula to Madras; and Madras again will be connected with Calicut by way of Coimbatore.

When all these various means of communication are completed, and English capital is applied to the resources of the country, we may expect that the exports from India will rise considerably in value, while the imports must rise in proportion. The country will thus become richer; the revenue will equal the expenditure; India will supply our manufactures with the raw material, and will take our goods in return; and British rule in Hindostan will prove both a blessing to that country and to our own.

CHAPTER V.

BRITISH POSSESSIONS IN ASIA. — ADEN. — CEYLON. — ASSAM. — ARACAN. — PEGU. — TENASSERIM PROVINCES. — PENANG. — MALACCA. — SINGAPORE. — LABUAN. — HONG KONG.

The British possessions in Asia, exclusive of Hindostan, are—taken in order from west to east—Aden, Ceylon, possessions in Further India, Labuan, and Hong Kong.

Aden is situated at the south-western corner of Arabia, and about 100 miles to the east of the strait of Babel-mandeb. It stands on the north-east side of a rocky promontory, about 15 miles in circumference, which is connected to the mainland by a low sandy isthmus. The town stands in the crater of an extinct volcano, and is surrounded by high naked rocks. Numerous wells are found in various parts of the neighbourhood, but the water is not abundant, and has a brackish unpleasant taste. The climate depends greatly on the monsoons, and though hot, it is not considered very unhealthy. There are two harbours, one on the east, the other on the west side of the isthmus; and the latter is said to be the best in Arabia.

Aden is an ancient, and was at one time a very celebrated city. From the eleventh to the thirteenth century, it maintained a great trade with India and China, and was

the entrepôt of the riches of the East. But it was ruined by the discovery of the passage round the Cape. When it came into the hands of the British (1839) it was a miserable place, with a population of about 600; now its inhabitants exceed 50,000. It is used as a depôt for the supply of coals to the steamers running between Suez and India, and is of great importance, both as a military post commanding the Red Sea, and as a centre of trade with the surrounding countries.

In the middle of the strait of Babelmandeb is the island of *Perim*, which has lately been occupied by the British for the purpose of building a lighthouse upon it. It is garrisoned by a portion of the troops from Aden. To the north-east of Aden, about the meridian of 55° east, is the group of *Kooria Moorja* islands which have become known through the abundance of guano found upon them. They were ceded to the English government, by the Sultan of Muscat, in 1854.

Ceylon is a large island, near the southern extremity of Hindostan, from which it is separated by the Gulf of Manaar and Palk's Strait. The island is pear-shaped, and is about 270 miles long, with an average breadth of 100 miles; and the area is about 24,000 square miles. The interior of the southern and broader part of the island is mountainous; but a belt of low land lies round the coast, and the northern part of the island is generally level. The summits of some of the mountains exceed 8000 feet; but the most remarkable summit is called **Adam's Peak**, which is 7420 feet in height. From this mountain Buddha is said to have ascended to heaven, and the impress of his foot is still pointed out. The shores of Ceylon, on the north and west, are low, but on the south and east, bold and rocky. The two principal harbours are **Trincomalee**, on the north-east, which is one of the finest in the world (p. 219); and **Point de Galle**, on the south coast. The island is nearly connected with the mainland of Hindostan by a ridge of islets and sandbanks, known as Adam's Bridge. Ceylon is richer in precious

stones than in useful metals. Iron and plumbago are found in some abundance; but these are the chief metallic ores. The ruby, amethyst, cat's eye, garnet, topaz, and sapphire are very abundant; and formerly there was a valuable pearl-fishery in the Gulf of Manaar, though it seems now worn out.

The climate of Ceylon is similar to that of Southern India, but is cooler, owing to the sea-breezes to which it is exposed. At Nieura Elia, in the interior, which has an elevation of 6300 feet, the thermometer ranges between 35° and 80°; but in the plains and valleys the heat is, of course, much greater. The monsoons prevail here as in Hindostan; and it is hotter and drier on the east coast of the island than on the west. The quantity of rain that falls is, on the average, three times the quantity that falls in England. The rivers are numerous, especially on the south and south-west sides, but are not large; the principal one being the **Mahawelli Ganga**, which rises in the interior of the island to the south of **Kandy**, and empties itself about 10 miles south of Trincomalee, after a course of 200 miles.

Ceylon is remarkable for the luxuriance of its vegetation. The forests abound with ebony, rose, satin, iron, and other ornamental woods. Palm trees are very abundant; and one of the most characteristic trees on the island is the cocoa-nut palm. Cinnamon and coffee are also produced in great abundance; and Great Britain is supplied with these articles chiefly from Ceylon. Most of the animals met with on the neighbouring continent, except the tiger, are found here. Elephants are very numerous, and bears, leopards, hyenas, jackals, monkeys, alligators, and reptiles of all sorts abound.

We have before stated (p. 237) that Ceylon, at one time, belonged to the Portuguese, and afterwards to the Dutch. The coast district came into the possession of the English towards the close of last century, but the interior remained in the hands of a native king, who was deposed in 1815. The present population amounts to about 1,900,000, of

whom about 500,000 are whites. The bulk of the inhabitants, who are called Singalese, are of Hindoo origin, but there are numbers of Mohammedans scattered about the island. A people called the *Veddas* are found in the remote parts of the interior, and are probably the aborigines. The prevailing religion is Buddhism; but Christianity has been introduced, and an English bishopric is established at *Colombo*, the chief city of the island. Ceylon is under the administration of a governor appointed by the British Crown, who is assisted by legislative and executive councils. The total exports to Ceylon from Great Britain amount to about £800,000.

The *Laccadive Islands* form a chain of small *atolls* or groups, about 100 miles from the Malabar coast. The cocoa-nut is the only valuable produce. Four of the islands belong to Britain; and five are subject to the native princes of *Cananore*, upon the adjacent mainland. The *Maldivé Islands* are a more considerable group, lying further to the south. The inhabitants are a civilized race, are expert sailors, and remarkable for their kindness to shipwrecked mariners. The population is about 200,000, and they are governed by a Sultan, who pays an annual tribute to the Governor of Ceylon.

The British possessions in Further India, exclusive of Singapore, are Assam, Aracan, Pegu, the Tenasserim Provinces, Malacca, and Penang.

Assam is a long narrow slip of country, lying in the valley of the Brahmapootra. It is bounded on the north and south by high mountains, but the greater part of the country is level, and studded over with little conical green hills. Gold, iron, and coal are found in several parts, and there are also valuable mines of amber and precious stones. The climate is considered rather unhealthy; the wind blows for nine months in the year from the east or north-east; the rainy seasons last from April to October. Rice is grown in considerable quantities, and the cultivation of the tea-plant is much attended to. The caoutchouc tree is indigenous to Assam, but is considered inferior to that

obtained from America. The total area of Assam is about 22,000 square miles, and the population about 700,000. The people are chiefly Hindoos, and followers of Brahma. Assam was formerly a province of Burmah, but was ceded to England in 1825. The chief towns are **Gowhatty**, on the south bank of the Brahmapootra, and **Goalpara**, on the frontiers of Bengal.

To the south of Assam are the territories of *Jynteah* and *Cachar*, which together have an area exceeding 10,000 square miles, and belong to Britain. Cachar is watered by the Barak, a feeder of the Brahmapootra.

Aracan is a narrow strip of country, lying on the eastern side of the Bay of Bengal. It extends from Cape Negrais to the district of *Chittagong*, and is separated from the kingdom of Burmah by a range of mountains, averaging 4000 feet high, which stretch along the whole eastern frontier. These mountains yield iron, gold, and silver, and are clothed with forests of oak, fir, teak, and bamboo. The low country is thickly covered with jungle, and intersected with rivers and lakes, the largest river being the **Kuladyne** or Aracan. The temperature averages 80°, and the climate is very damp. Rice forms the staple production, and cotton, sugar, tobacco, and indigo, are also cultivated. Salt also forms an important article of export. The area of Aracan is about 16,000 square miles, and the inhabitants, who are chiefly Buddhists, number 250,000. Aracan was conquered by the British in 1825, and ceded by the Burmese the following year. The chief towns are **Aracan**, on the river of that name, about 50 miles from the sea; **Akyab**, at the mouth of the same river, the capital of the province; and **Sandoway**, further to the south.

Pegu, formerly a province of Burmah, embraces the delta of the Irrawady, with a large adjoining tract of the interior. The total area is about 20,000 square miles. The minerals of the province comprise iron, tin, lead, and precious stones. Rice is the principal object of cultivation. Pegu was annexed to the British Empire in 1853. The

town of **Pegu** stands on a river of that name, which joins the eastern branch of the Irrawady. **Rangoon**, the largest town in the province, is on the eastern arm of the Irrawady.

The **Tenasserim Provinces** consist of Martaban, Ye, Tavoy, and Mergui, and form a long narrow strip of territory, lying on the eastern side of the Gulf of Martaban. They are separated from the kingdom of Siam by a range of mountains, averaging from 3000 to 4000 feet in height, and which, like the greater part of the country, are covered with dense forests of teak and other trees. Iron is very abundant in the provinces of Ye and Tavoy, and tin is found further south. Gold, copper, and antimony are found also in various parts, and gold has been found in the Mergui province. From Tavoy southwards numerous islands, thickly clothed with vegetation, line the coast, and form a barrier against the violence of the rains brought by the south-west monsoon. The climate of these provinces is considered, for Europeans, the most salubrious of all known tropical countries; and the soil, where cultivated, is eminently productive. Rice, cotton, indigo, and pepper, are the chief products; but sugar, coffee, tobacco, and spices would grow freely. Palm trees of all kinds are very abundant. The tiger, leopard, and other wild animals infest the jungles; and it is said that elephants are more numerous than in any other part of the East, except Ceylon.

The total area of the **Tenasserim Provinces** is about 32,000 square miles, and the population about 120,000. There is a little manufacturing carried on in weaving cotton and silk goods, and in shipbuilding; and a brisk trade is conducted with Rangoon, Chittagong, Dacca, Penang, and the Nicobar Islands: the natives exporting rice, tobacco, gambier, ivory, edible birds' nests, and teak wood, and receiving manufactured goods, betel-nut, and opium in return. The chief towns are **Maulmein** and **Amherst**, on the river Saluen; **Tavoy**, **Mergui**, and **Tenasserim**.

Assam, Aracan, Pegu, and the Tenasserim Provinces are subject to the Bengal Presidency ; Penang, Malacca, and Singapore, form a distinct province, under the title of the *Eastern Settlements*.

The Andaman Islands lie on the west side of the Gulf of Martaban, and consist of four principal, and several smaller islands. The islands are mountainous, and in great part covered with forests, the timber consisting of teak, iron-wood, ebony, and other woods ; cocoa-nuts and bamboos are also abundant. Edible birds' nests are found in the cliffs, but the chief food of the inhabitants consists of fish. The natives belong to the Papuan race (p. 86). They wear no covering, but plaster over their bodies with clay, and are exceedingly hostile to Europeans. A penal settlement for mutinous sepoys was established here by Britain during the mutiny in India. The Nicobar Islands, lying to the south, belong to Denmark.

Penang, or Prince of Wales Island, lies off the west coast of the Malay peninsula. It is rather mountainous in the centre, but the hills decline to the east and west, and low flats, bordered by cocoa-nut trees, fringe the shores. The climate is healthy, and the soil fertile ; and certain spices, especially nutmegs, mace, and cloves, are very abundant, and of excellent quality. The island has an area of 162 miles, with a population of 40,000. **Georgetown**, the capital, situated on the eastern side of the island, is one of the neatest towns in the East Indies. A narrow channel, two miles in width, separates this part of the island from the mainland, where there is a district called *Wellesley Province*, which has an area of 200 square miles, and a population of 50,000, and is a dependency of Penang. This island was acquired by the East India Company in 1785 ; Wellesley Province was obtained in 1800.

Malacca, on the south-west of the Malay Peninsula, is a territory about 1000 miles in area. Its shores are rocky, its interior mountainous ; the climate is healthy, and the soil fertile. The population is about 58,000. The town of **Malacca**, on the Malacca River, has a popu-

lation of about 5000. This colony was given up to the English by the Dutch in exchange for Bencoolen, in Sumatra, in the year 1825.

Singapore is the name of an island lying at the southern extremity of the Malay Peninsula. It is rhomboidal in shape, is about 25 miles long from east to west, and has an area of about 270 miles, which, with some adjacent islets, makes the whole area of the settlement 330 miles. The surface is undulating and covered with jungle, in which tigers, sloths, monkeys, and several species of deer abound. The climate is hot, ranging from 71° to 89°, but healthy, and the soil well adapted for the growth of spices. The channel, separating the island from the peninsula, is about two miles broad, and was formerly the route for vessels proceeding from India to China. The town of **Singapore** stands on the southern extremity of the island, and is divided into three parts, inhabited by the Malays, Europeans, and the Chinese respectively. It is a free port, and vessels from all parts of the world may be seen anchored together in its harbour. Its trade embraces India, China, the Eastern Archipelago, Australia, Europe, and America. Junks come from the Chinese Sea with the north-east monsoon, and return with the south-west monsoon. The imports and exports are about equal and each amount to about £4,000,000. The imports, from Great Britain alone, in 1862, exceeded in value £1,000,000. As a place of call, Singapore is of great importance to English steamers, and it lies in the course of the regular mail route between India, China, Australia, and Europe. It is also important in a military point of view, as it commands the entrance into the Chinese Sea.

Singapore was taken possession of by Sir Stamford Raffles in 1818, and the possession was subsequently confirmed by a treaty with the native prince to whom it belonged. The whole settlement has a population of about 60,000.

Labuan is a small island, of triangular shape, off the north-west coast of Borneo. It has an area of 26 miles,

with a population of 1000; excellent coal is found in the north-east of the island, and is shipped to Singapore. On the south-east side of the island is an inlet called Victoria Harbour, which affords good anchorage. On the adjacent coast of Borneo is the small province of *Sarawak*, which belongs at present to Sir James Brooke. The town of *Sarawak* has a population of 12,000.

Hong Kong is a small island at the mouth of the Canton River. It has an area of 30 square miles, with a population of 120,000. The island is rugged and mountainous, well supplied with water, but with no trees of any size. On the north side of the island, and situated on a splendid bay, is the town of **Victoria**, which contains one-third the population of the island. The trade with Hong Kong is very considerable, and the value of the imports of British and Irish produce and manufactures amounts to about £1,500,000.

CHAPTER VI.

BRITISH POSSESSIONS IN AFRICA.—**GAMBIA**.—**SIERRA LEONE**.—**SETTLEMENTS ON THE GOLD COAST**.—**CAPE COLONY**.—**BRITISH KAFFRARIA**.—**NATAL**.—**ST HELENA**.—**ASCENSION**.—**THE MAURITIUS**.

Our possessions in Africa may be classed under three heads,—those on the West Coast, those in Southern Africa, and the Islands. The settlements on the West Coast are **Gambia**, **Sierra Leone**, and the **Gold Coast settlements**.

Gambia.—The river **Gambia** empties itself into the Atlantic about 14° north of the equator after a course of about 600 miles. The British settlements extend along this river for a distance of 300 miles from the sea. The chief settlements are **Bathurst**, on an island at the mouth of the river; **Fort James**, on another island, 20 miles up the river; and **Fort George**, on **Macarthy's Island**, 200

miles further in the interior. The population of this colony is about 5000, the majority being negroes.

Sierra Leone.—This settlement lies south of Gambia and within 10° of the equator. Its surface is for the most part hilly and rugged, but a belt of swamps extends along the coast with a breadth varying from one to three miles. The whole district has an area of about 500 square miles, with a population of 42,000. The chief settlement is **Freetown**, which stands on a rocky peninsula, on the south side of the estuary of the *Rokelle*, which is there seven miles broad.

Gold Coast Settlements.—The Gold Coast forms a portion of the coast lying round the gulf of Guinea. The territory under British protection is said to have an area of 8000 square miles. The surface is for the most part composed of flat grassy plains; and the shore is low and sandy, and exposed to a violent surf. The chief settlement is **Cape Coast Castle**. To the westward of this point, Britain possesses **Dixcove**, and to the east **Anamaboe** and **Fort James**. The total population is about 300,000.

The climate of all our settlements in Western Africa is strictly tropical, and is considered unhealthy for Europeans. The heat is very great—averaging about 80°—and the rains heavy (p. 54). The soil in general is very fertile, and the productions such as are generally met with in tropical countries. The chief exports from Western Africa are teak, from Sierra Leone; palm-oil, from Sierra Leone and the Gold Coast; ground-nuts and bees' wax, from Gambia; ivory, pepper, and ginger. The total value of the exports is about £300,000; and the imports of British manufactures and produce is nearly £400,000.

Gambia and Sierra Leone form two separate colonies; but the Gold Coast Settlements are under the jurisdiction of Sierra Leone, which also includes the *Isles de Los*, *Sherboro*, and other islands along the coast. An English bishop is established at Sierra Leone, whose diocese embraces the whole of our settlements in Western Africa.

Speaking generally, we may say that our possessions

in South Africa lie south of the Orange River; and in this district, besides Cape Colony, British Kaffraria, and Natal, there is Kaffraria Proper, and two republics—Transvaal Republic and the Orange River Sovereignty. The distinguishing physical feature of South Africa is a range of mountains which runs east and west across the middle of Cape Colony. This range bears the name of **Snowy Mountains**, and in the eastern part of the Colony it attains, in **Mount Compass**, a height of 10,000 feet. The Snowy Mountains are here connected with another range which runs northwards, forming the western boundary of Kaffraria and Natal, and which is known in different parts under the names of **Stormy** and **Dragon** mountains. On the western side of Cape Colony, also, a range running north and south is connected with the Snowy Mountains, and is known as the **Roggeveld** range. South of the Snowy Mountains, and parallel to them, is the range called **Zwarte Bergen**, or Black Mountains, which are connected in the west with the **Bokkeveld**, which runs parallel with the Roggeveld range. Still further south there is a third range running east and west, from 20 to 60 miles from the south coast. This range, which has an average elevation of 4000 feet, as well as the Zwarte Bergen, which is about 1000 feet higher, gradually declines to the east, and loses itself on the coast.

These various mountain-chains determine the configuration of the surface of South Africa. North and west of the Snowy and Dragon Mountains, the country slopes towards the Orange River. Between the Snowy Mountains and Zwarte Bergen is an immense plateau, about 3000 feet above the sea, and extending from east to west for a distance of 400 miles, with a breadth varying from 50 to 60 miles. This region—called the *Great Karroo*—is thinly covered with soil impregnated with salt. Rain falls very seldom, and vegetation is scanty. South of the Black Mountains there is a “karroo” of less elevation, containing some well-watered and fertile land, but interspersed with desert tracts; while the belt next the sea is

covered with a rich deep soil. Kaffraria and Natal are both very fertile, but the district along the west coast is arid and barren. The minerals of South Africa are not of much importance, though *coal* is said to have been found in Natal. A little *copper* and *iron* are found in the Cape Colony, with *alum*, *salt*, and *saltpetre* in small quantities.

The coast line of South Africa is about 1500 miles in length, of which 1200 miles belong to the Cape Colony. The north-west coast is not much known, but is supposed to be low and sandy. Further south, the coast becomes bolder, and forms numerous bays and headlands. **Sal-danha Bay**, on the west, and **St Simon's**, on the south, are good harbours, and well sheltered, but the others are all, more or less, exposed. The Cape, which gives the name to the colony, is the extremity of a rocky peninsula, on which stands an isolated mountain-group, the highest summit of which is **Table Mountain**, which has an elevation of 3580 feet. Cape Agulhas is the most southern point in the colony, and, indeed, of the whole continent of Africa. **Algoa Bay** is a fine inlet, in the south-east of Cape Colony, but it is very much exposed. In Kaffraria and Natal, low grassy plains line the coast, but there is only one good harbour—**Port Natal**—though that is an excellent one.

South Africa, lying as it does within 35° of the equator, must have a much warmer temperature than England; and we have already mentioned that the isotherm of 60° passes through Cape Town (p. 72). Natal, lying still nearer the equator than Cape Colony, has a much warmer climate, and the thermometer is said to average 67° . The great defect in the climate of Cape Colony consists in the unsteadiness and irregularity of the rains. In some tracts, bordering on the Great Karroo, there has occasionally been no rain for two or three years together, while at other times, the rains fall in torrents; but, upon the whole, there is a deficiency of rain in this colony (p. 52), and this circumstance, as we shall see, affects the character of the productions. In Kaffraria and Natal, however, the

climate is much more regular, and rain is abundant. In all our possessions in South Africa, the climate is considered very healthy.

Owing to the scanty rains, this part of Africa is very deficient in rivers. There are a great many streams it is true, but most of these are dry during a great portion of the year, and only appear as rivers during the rainy season.

The **Orange River**, which is by far the most important river in this part of South Africa, is formed by the union of two branches, known respectively as the **Nu Gariep**, and the **Ky Gariep** or **Vaal**. Both these streams rise in the Dragon Mountains, and, after surrounding the Orange River Settlement, unite, and flow westward under the name of the Gariep or Orange River. The principal feeders are the **Hartebeest**, on the left, and the **Fish River**, on the right bank; and the Gariep empties itself into the Atlantic, after a course of 1000 miles in length. Besides the Orange River, we may mention the **Elephant's River**, which also empties itself on the west; the **Breede**, which flows towards the south; the **Keiskamma**, which forms part of the eastern boundary of Cape Colony; the **Great Kei**, which flows between British Kaffraria and Kaffraria Proper; and the **Tugela**, which forms the northern boundary of Natal.

We have already mentioned (p. 76) that South Africa forms a distinct botanical region, characterized by the abundance of aloes, geraniums, irises, heaths, and stapelias or carrion-flowers. Most of these flourish to the south of the Great Karroo; but the stapelia, with its thick fleshy leaves and flowers, is almost confined to the sandy district on the west. Towards the east of Cape Colony there are extensive thickets, called the *bush*; but in Kaffraria and Natal the country is more open, and consists of grassy plains, with rivers fringed with trees, and mountains clothed with timber, including iron-wood, yellow-wood, and a species of palm. Cape Colony is naturally deficient in timber; and with the exception of the silver tree,

which grows in groves near Table Mountain, none of the trees, indigenous to the colony, attain to any great height.

The wild animals of South Africa are numerous and large, and include the elephant, rhinoceros, hippopotamus, lion, leopard, hyena, jackal, zebra, buffalo, and antelope. The rhinoceros is now, however, nearly extirpated; the hippopotamus is found only in the Great Fish and Kei Rivers; and the elephant and lion have retired from the settled parts. Leopards and hyenas are still not uncommon, especially in the eastern districts. Antelopes are numerous, and include the springbok, the koo-doo, the hartebeest, and eland (p. 82). Eagles, vultures, pelicans, flamingoes, cranes, and turtle-doves are met with, and the ostrich inhabits the Great Karroo. Some of the birds in Cape Colony are peculiar to that region; among which may be mentioned the secretary-bird, the honey-guide, and the weaver-bird. Snakes and other reptiles abound, including the boa and the deadly cobra-da-capello. Some rivers are well stocked with fish, though this is not generally the case; but in the surrounding seas, and along the coasts, whales and seals abound.

The original inhabitants of South Africa seem to have belonged to two different races: the Hottentots, dwelling between the Orange River and the Cape, and the Kaffirs, dwelling to the east and north-east. The Hottentots belong to the Ethiopian type (p. 86), and are similar to, though not identical with, the Negro race. They have slight limbs, prominent cheek bones, and a brown skin. They are said to be lively and good humoured, and make capital shepherds and herdsmen. The Kaffirs are a tall, well-made race of men, of a bronze colour; and a study of their language and religious customs has led some to think that they are of Arab descent. The Bushmen are a short degraded race, dwelling in the valleys of the Snowy Mountains: they seem to belong to the Hottentot family. About the year 1650, the Dutch effected a settlement in South Africa, and ten years later they had acquired the whole peninsula of the Cape. They soon

crossed the isthmus which connects it with the mainland, and gradually spread over the southern part of the continent; so that, in 1750, they had possession of all the country south of the Snowy Mountains. In 1795, the colony was captured by the English, but was restored at the Peace of Amiens. In 1806, it was again seized, and the British title to it was recognised in 1815.

The Dutch, during their possession of the colony, had acquired a great many Hottentot slaves, and when slavery was abolished by Great Britain (1834), although some compensation was allowed to the settlers, yet great losses were incurred. A number of Dutch farmers, or boers, as they are called, dissatisfied with the treatment they had received, emigrated with their families, and crossing the Dracken Bergen, or Dragon Mountains, occupied the district of Natal, and set up an independent republic. This state Britain refused to acknowledge, and Natal was made a British colony in 1845. But about 25,000 of the Dutch again *trekked*, or migrated, and crossing the northern branch of the Orange River, established the Trans-Vaal Republic, which still maintains its independence. In 1848, the boundary of Cape Colony was extended to the Orange River, on the north, and to the Keiskamma, and a line joining it with the Nu Gariep, on the east; and about the same time Britain laid claim to the Orange River settlement: this claim was, however, subsequently abandoned. During the first half of the present century, the settlers of the Cape Colony were harassed by invasions of the Kaffirs, but in 1853 a portion of Kaffraria, lying between the Keiskamma and Great Kei rivers, was annexed, and now forms British Kaffraria. It is a well watered and highly fertile country, and has a population of about 50,000, of whom 8000 are Europeans. The mass of the population are under native chiefs, who receive monthly stipends from the governor of the Cape.

The Cape Colony has an area of 217,000 square miles, with a population of about 270,000, which is little more

than one person to a square mile. Owing to the irregularity of the rains, the colony is better suited for pasture than for agriculture, and hence immense numbers of sheep and oxen are reared. The native sheep have been improved by crosses, and wool is now the great staple of the colony. In the western part of the colony wine of a good quality is produced, and the vineyards of **Constantia**, about eight miles south of **Cape Town**, are especially noted. Excellent wheat, maize, rye, and barley are grown, and grain and flour are now exported. The colony is deficient in internal means of communication, as the rivers are not available for navigation; but good roads have been made, and several railways are in progress. The exports, which consist chiefly of wool, wine, hides, horses, and corn, amount to the value of nearly £2,000,000 annually; and the imports of British produce and manufactures amount to nearly as much. The governor of the Cape is appointed by the Crown, and is assisted by a Legislative Council and a House of Assembly, both elected by the colonists. There are two English bishoprics in the colony, one at **Cape Town**, which is the capital of the colony, and the other at **Graham's Town**, near the eastern frontier.

Natal has an area of about 18,000 square miles, with a population of 150,000, of whom about 20,000 are Europeans. The country rises in four successive terraces, averaging about 20 miles in width, from the shore to the mountains in the interior, each terrace having its peculiar climate and production. The coast region has a warm tropical climate, and produces sugar, coffee, cotton, arrow-root, and indigo. The second terrace is well adapted for grazing purposes; the third is thickly clothed with forests; and the fourth is suitable for wheat and other European produce. The chief exports from the colony at present are sugar, arrow-root; hides, ivory, and wool. The chief towns are **Pietermaritzburg** and **D'Urban**. **Pietermaritzburg** stands on the second terrace, at a distance of 50 miles from the sea, and is the capital of the colony. The average annual temperature here is 67°. **D'Urban** stands on

the north-east side of the inlet of Port Natal: a steamer runs from this place to Cape Town, which is 1000 miles distant. The constitution of Natal is somewhat similar to that of the Cape. A bishopric was established in the colony in 1853.

It has been proposed to form a federal union of all our dependencies in South Africa, and to include the independent states lying on the frontiers. Sir G. Grey, the late governor of the Cape, was understood to be strongly in favour of such a union.

Ascension is a small rocky island in the South Atlantic, about 8° south of the equator, and 14° west of Greenwich. It has an area of about 30 square miles, with a population of 500. It was taken possession of by the English in 1815, chiefly for the purpose of making it a victualling station and hospital for the use of the squadron engaged in the suppression of the African slave trade. The government settlement is **Georgetown**, on the north-west side of the island. Ascension is famous for its turtle, and wild goats are also plentiful.

St Helena.—This island lies about 800 miles south-east of Ascension, and 1200 miles distant from the nearest part of the coast of Africa. It is an irregular oblong in form, and has an area of about 47 square miles. The climate is healthy—averaging about 61°—and the soil fertile. It is much used as a place of call, where vessels homeward bound may obtain fresh provisions and water. The capital of the island is **Jamestown**, situated on the north-west of the island, and protected by strong batteries. A bishop was established here in 1859, whose diocese includes Ascension and *Tristan d'Acunha*—a small group of islands lying about 1750 miles south-west of the Cape.

Mauritius.—This island lies in the Indian Ocean, about 20° south of the equator, and 600 miles east of Madagascar. It is nearly oval in form, and has an area of 700 square miles. The surface is much diversified, and, in the south-west, rises, in some elevations, to nearly 3000 feet. The climate is healthy, but very warm,—averaging

about 78°. The produce of the island consists principally of sugar, rice, coffee, cotton, and indigo, with quantities of ebony, iron-wood, and tortoise-shell. Mauritius originally belonged to the Dutch, but it afterwards fell into the hands of the French, from whom it was taken by the English in 1810. It was finally ceded to this country in 1815. The present population is about 310,000, the majority of whom are negroes and other people of colour; the white inhabitants are mostly of French descent. A great trade is carried on with India, Australia, the Cape, and Great Britain. The chief export to Great Britain is sugar; and rice is sent in large quantities to the Cape. In 1862, the exports from Mauritius to Great Britain amounted to nearly £1,000,000; and the imports of British produce and manufactures exceeded £500,000. The chief town is **Port Louis**, on the north-west side of the island.

The government of Mauritius includes as dependencies the island of Roderigue, the Seychelles, the Amirante islands, and the Chagos Archipelago. *Roderigue* is situated about 300 miles to the east of the Mauritius, and has an area of 188 miles. The *Seychelles* lie about 1000 miles north of Mauritius, and compose a group of about 30 islands, of which *Mahé*, on which stands **Port Victoria**, is the largest. The *Amirante* Islands are a low group, lying to the south-west of the Seychelles; and the *Chagos Archipelago* lies to the south of the Maldive Islands (p. 250). They are covered with cocoa-nut trees, and are often visited by ships for the sake of fresh water and provisions.

Mauritius and its dependencies have together an area of about 1020 square miles, and form the diocese of an English colonial bishop.

CHAPTER VII.

BRITISH NORTH AMERICA.—SURFACE AND MINERALS.—
CLIMATE. — RIVERS. — PRODUCTIONS. — HISTORY. —
COLONIES.—HUDSON BAY COMPANY.—INTER-OCEANIC
RAILWAY.

British North America embraces the whole of the continent north of the 49th parallel and the basin of the St Lawrence, with the exception of a district in the north-west which belongs to Russia. The whole area exceeds 3,000,000 square miles, but only a portion of this vast country is settled, a great part being rendered unfit for colonization by the severity of the climate.

Surface and Minerals.—Upon the whole, the surface of this part of the American continent is level, as with the exception of the **Rocky Mountains**, there are few ranges of any great altitude. These mountains in their northern portion are not more than 1000 or 2000 feet high; but farther south they increase in elevation, and in the southern part of British America attain an altitude of 7000 or 8000 feet. Some of the peaks, however, considerably exceed this average height; **Mount Brown** is 15,900 feet high; and both **Mount Murchison** and **Mount Hooker** exceed 15,000 feet. There are several passes across the Rocky Mountains, the principal of which is the Vermilion Pass, in latitude $51^{\circ} 10'$, which has an altitude of less than 5000 feet.

The country to the west of the Rocky Mountains descends in terraces to the shores of the Pacific. Running parallel with the Rocky Mountains, and on the western side, are the **Peak Mountains**; and along the coast is a range known as the **Sea Alps** or **Cascade Range**.

The country to the east of the Rocky Mountains, exclusive of the basin of the St Lawrence, consists of an extended plain, gently sloping towards the north, and divided into two portions by the great inland sea known

as Hudson Bay. The peninsula portion to the east is Labrador, while the remaining and larger portion is now called Rupert's Land. On the north side of the river St Lawrence there is a range of heights known as the **Mealy Mountains**, which stretches from the neighbourhood of Cape Charles, in a south-west direction, as far as the banks of the Ottawa, and attains in some places an elevation of 1500 feet. Between the river Saguenay and Quebec the ridge is well defined, but further west it is not so well marked, and broad plains begin to extend inland from the banks of the St Lawrence. On the south side of the river, another range, called the **Green Mountains**, runs from Point Gaspé, on the Gulf of St Lawrence, to the neighbourhood of Quebec, and then bending southwards, is connected with the Appalachian system. Between the Gulf of St Lawrence and Hudson's Bay there is a crescent-shaped range, called the **Wotchish** mountains, which seems to have a considerable elevation.

The minerals of British North America are numerous and important. To the west of the Rocky Mountains, in British Columbia, *gold*, *copper*, *iron-ore*, *gypsum*, and *marble*, as well as valuable deposits of coal, have been found. *Coal* is also known to exist in many parts of the district to the east of the Rocky Mountains, and is found cropping out in various parts of the basin of the Saskatchewan. *Gold*, *silver*, *lead*, *copper*, and *tin* have been found in small quantities to the north of Lake Superior; *iron* is abundant in the neighbourhood of Lakes Erie and Ontario; various kinds of *marble* have been found in the basin of the Ottawa; and in the district of Gaspé and New Brunswick *precious stones* are met with. Coal, iron, and building-stone, are abundant in the districts lying round the shores of the Gulf of St Lawrence and the Bay of Fundy.

Climate.—The climate of such an extent of country as British North America must of course be very various. The country lies partly in the temperate and partly in

the frigid zone, and the west coast is much warmer and more equable than the east coast. Vancouver's Island has a mean annual temperature of about 50° ; while Newfoundland, which lies a little further south, on the opposite side of the continent, has an average temperature of only 38° . British Columbia has a climate resembling that of England. The climate of Canada is colder, dryer, and more extreme, but very healthy. Its mean annual temperature is only about 42° , while that of British Columbia is eight degrees higher; but its summers are almost tropical. In winter the thermometer falls as low as 26° below zero; but the cold is not felt so much as it is sometimes in England, owing to the dry state of the atmosphere, and the general absence of wind. New Brunswick, and other provinces further to the east, have a climate similar to that of Canada, but more humid and temperate, owing to their proximity to the sea. The country between Canada and the Rocky Mountains has an excessive climate (p. 73), the summers being short but very hot; and the winters long and severely cold. Wheat requires a mean annual temperature of 39° , with a summer temperature of 56° to bring it to perfection; and in favourable seasons it will grow on the banks of the Liard River, in the parallel of 60° ; but it will not ripen on the shores of Hudson's Bay, in districts which lie much further south, as the summer temperature is too low. A curve drawn from the mouth of the River Mackenzie to the middle of Hudson's Bay, and continued across Labrador to Cape Farewell, in Greenland, is the northern limit of trees. This line also marks off the coldest part of the American continent.

Rivers.—The principal rivers in British North America are the Fraser, the Mackenzie, the Saskatchewan, and the St Lawrence.

The Fraser.—In describing the River Systems of England, we noticed that, sometimes, a number of rivers had their rise in a central knot of mountains (p. 123). Such a knot appears in that part of the Rocky Mountains

where rise the summits of Brown, Murchison, and Hooker; for, in the neighbourhood of this group, the Columbia, the Fraser, the Athabasca, and the Saskatchewan have their sources. The Fraser, in the first part of its course, flows north-west, then, making a sudden bend to the south, it receives on its right bank **Stuart River**, which drains a lake of the same name. Continuing southward, it at length receives the **Thompson**, on the left bank. This feeder rises in the Peak Mountains, and, after draining several lakes, joins the Fraser at a place called the "Forks." The main stream still flows southward for a considerable distance, and then, turning west, it bursts through the Cascade Mountains, in a succession of falls, and empties itself into the Gulf of Georgia.

The lower course of the river is through a country hilly and covered with forests of pine, cedar, and other evergreen trees. Higher up the stream, the country is not so productive, being cut up by mountains, ravines, torrents, lakes, and marshes. The basin of Thompson River, however, is described as being exceedingly fertile and beautiful.

The Mackenzie.—The most distant source of the Mackenzie is in the River Athabasca, which rises at the foot of Mount Brown, and, after a course of 700 miles, empties itself into Athabasca Lake. Into this lake falls the **Peace River**, which flows from the Rocky Mountains. A stream called **Slave River** connects Athabasca with Slave Lake, and a river issuing from the western extremity of Slave Lake is often looked upon as showing the true source of the Mackenzie. After flowing some distance to the north-west, the main stream is joined by **Turnagain**, or **Liard's River**. The remaining course of the Mackenzie is almost due north, and on its way it receives on its right bank a small feeder which drains Great Bear Lake. It empties itself by a delta into the Arctic Ocean, after a course of more than 2000 miles.

The Saskatchewan is formed of two branches which rise in the Rocky Mountains, and, after a course of about

500 miles, unite. The river now flows westward for a distance of about 300 miles more, and enters Lake Winnipeg. This lake also receives the **Red River**, the **Assiniboin**, and other streams, and empties its waters through the channel of **Nelson River**, which flows into Hudson Bay. The total length of the river, from the source of the Saskatchewan to the mouth of the Nelson, is about 1400 miles.

The St Lawrence.—This river receives different names in different parts of its course. It rises under the name of **St Louis**, a little to the west of Lake Superior. Between Lakes Superior and Huron, the river is called **St Mary**; between Huron and Erie, it is called **St Clair** and **Detroit**; and between Erie and Ontario it is known as the **Niagara**. About 20 miles from Lake Erie are the celebrated "Falls," where the water, precipitated over a ledge of rocks 150 feet high, is computed at 100,000,000 tons per hour. After leaving Lake Ontario the river takes the name of **St Lawrence**, and its course is thence north-west to the sea. The chief feeders are the **Ottawa**, **Richelieu**, **St Francis**, **St Maurice**, **Chaudiere**, and **Saguenay**.

The Ottawa is about 400 miles long, and abounds with well-wooded islands and beautiful cataracts. The town of **Ottawa**, the future capital of Canada, stands on its banks. The Rideau Canal runs from this place to **Kingston** on Lake Ontario. At the junction of the **Ottawa** and **St Lawrence** is the island of **Montreal**, on which stands the city of that name. The **Richelieu** is a right-bank feeder of the river, and flows from Lake Champlain, which lies within the territory of the United States. A little further down, the **St Lawrence** is joined by the **St Francis**, which drains one of the most fertile districts in Canada. The **St Maurice** joins the main stream, on the left bank, after a course of 200 miles between high and rocky banks clothed with magnificent timber. At the mouth of this feeder stands the important town of *Three Rivers*. From the mouth of the **St Maurice**

to *Quebec* the *St Lawrence* receives no feeders of importance, except the *Chaudiere*, which flows from the United States, and is about 100 miles long. Below *Quebec* the river increases in width considerably, and its shores become bold and rocky. The *Saguenay*, which joins it in this part of its course, rises in *Lake St John*, and flows between banks varying in height from 200 to 2000 feet, the cliffs in some places rising perpendicularly from the water's edge.

At the island of *Anticosti* the river expands into the *Gulf of St Lawrence*, and thus finishes a course which exceeds 2000 miles in length. The basin of the *St Lawrence* is said to have an area of 500,000 square miles, and together with the great lakes is said to contain half the fresh water upon the globe.

Productions.—The natural productions of British North America are as various as its climate. In British Columbia and in Canada the cedar, arbutus tree, and other evergreens, with the maple, to whose foliage the woods owe their beautiful autumnal tints, are very numerous. Forests of pine, oak, and other European trees still abound, and various kinds of berries, nuts, grapes, and cherries grow wild. Canada also, like all countries possessing a dry climate, produces flowers of great beauty. In summer the woods are crowded with many that find a place in our English gardens; among which may be mentioned, the scarlet lobelia, the purple gentian, the lupin, the columbine, and honeysuckle; but to the great regret of emigrants from Britain, the climate is too dry for the daisy and primrose.

Little is known of the interior of Labrador, but it appears to be covered with numerous lakes and swamps producing quantities of moss and stunted shrubs. In sheltered places, juniper, birch, and poplar trees will grow and afford shelter during the summer to the deer, bears, wolves, and foxes which winter drives to the coast. Round the southern shores of *Hudson Bay*, and stretching into the interior, as far as *Lake Winnipeg* and the

borders of Canada, are extensive forests, which produce the fur-bearing animals in great abundance. The basin of the Saskatchewan consists partly of extensive prairies covered with luxuriant grass, and partly of forest land cleared by the Indians with fire. Between the Saskatchewan and Lake Winnipeg the country is described as partially wooded, and intersected with a few lakes and swamps; while north of the river-basin, thick woods of pine, birch, and alder alternate with lakes and swamps, but gradually diminish in size and amount of timber as they approach the northern limit of trees.

The principal wild animals found in British America are the bison, musk-ox, the elk, and various kinds of deer; the grizzly, brown, black, and white bears; wolves, beavers, and various kinds of fur-bearing animals, among which may be mentioned martens, foxes, squirrels, and otters. Flocks of turkeys, geese, ducks, and pigeons are occasionally met with in a wild state, and wild bees are numerous. The seas, rivers, and lakes abound with fish.

History.—The original inhabitants of this part of the American continent belong to two races—the Indians and the Esquimaux—both of which seem to belong to the Mongolian type. The characteristics of the Indians we have already noticed (p. 86.) The Esquimaux dwell on the shores of the Arctic Ocean and the coast of Labrador; they are of short stature, and subsist chiefly on fish; they are more strongly marked with the characteristics of the Mongolian type than the American Indians are.

It appears that adventurers from Iceland had discovered the American continent four or five hundred years before the time of Columbus, but among the nations of Central and Southern Europe, the first to discover North America was John Cabot, a native of Venice, who resided in England during the reign of Henry VII., and who sailed under a patent granted by that sovereign. He sailed from Bristol, and came in sight of Labrador, 24th June 1497. The next year his son Sebastian discovered Newfoundland, and soon after a Portuguese expedition visited

these parts. In 1535, Jacques Cartier, a Frenchman, with three small ships, set out for America, reached the mouth of the St Lawrence, and sailed up the river as far as Montreal, then called *Hochelaga*. The French subsequently colonized the basin of the St Lawrence, while the English took possession of the country further to the south.

In 1670, the Hudson Bay Company was established, and at the peace of Utrecht (1713), the right of Britain to the Hudson Bay territory, as well as to Newfoundland and Nova Scotia, was acknowledged by the French. England, at this time, also possessed the greater part of the country between the St Lawrence and the Gulf of Mexico, and lying eastward of the Mississippi. In 1763, Canada, New Brunswick, Cape Breton, and Prince Edward Island were ceded to this country; but twenty years later we lost the United States. No further change of any importance was made in our North American possessions until quite recently, when, owing to the discovery of gold in Fraser River, and the influx of emigrants from California and other parts, a portion of the territory to the west of the Rocky Mountains was erected into the colony of British Columbia (1858). Besides British Columbia, the other British Colonies in North America are Canada, New Brunswick, Prince Edward Island, Nova Scotia, Newfoundland, and Vancouver's Island. Of the two last mentioned, we shall speak in a subsequent chapter.

British Columbia.—This colony lies between Simpson River on the north, and the 49th parallel on the south; the Rocky Mountains on the east, and the Pacific on the west. It has an area of 225,000 square miles, with a population of only 60,000, but the numbers are rapidly increasing. We have already noticed the surface, minerals, climate, and productions of this colony. The land seems to rise in three terraces from the Pacific; the coast district possesses a rich vegetable soil; the second terrace, between the Cascade and Peak Mountains, has a higher elevation, and is well suited for pasture land; the third, being in

close proximity with the snows of the Rocky Mountains, has a severe climate, and is subject to great changes in temperature. There is a large quantity of fertile land in the colony, and the fruits and grains of Europe produce abundant crops. Both a governor and a bishop have been appointed; and the town of **New Westminster**, about 10 miles from the mouth of the Fraser, is designed as the future capital.

Canada lies almost entirely within the basin of the St Lawrence. In form it is almost an equilateral triangle, of which the base is the 50th parallel, and *Point Pelee*, at the south-west corner of Lake Erie, the apex. The most eastern point is Cape Gaspé, and it stretches westward to the 90th meridian. It is bounded on the south by the United States and New Brunswick, and the total area is about 350,000 square miles. The colony is divided into Eastern and Western Canada by the river Ottawa. Western Canada is upon the whole a level district with a very fertile soil: between Lakes Huron, Erie, and Ontario there is an extensive plain comprising 25,000 square miles. Eastern Canada is less fertile, but exceedingly beautiful and picturesque. It possesses boundless forests, and numerous lakes and rivers, dotted with islands, and adorned with cascades.

The inhabitants of Eastern or Lower Canada are chiefly French, descendants of the first colonists: the people of Upper Canada are chiefly emigrants from Britain and their descendants. There are about 30,000 Indians dwelling in the tracts bordering the great lakes, who belong chiefly to the Ojibbeway and Mohawk tribes. The total population of Canada is 2,500,000.

Clearing the ground and cultivating the soil are the two principal occupations of the people of Canada. The timber trade employs a great many persons in Lower Canada, and as many as 17,000,000 cubic feet of white pine alone have been exported from Quebec in a single year. The ground, wherever it is cleared, is of great fertility, and several successive crops of wheat can be

raised from the same soil. Wheat, barley, rye, oats, buck-wheat, and maize are the principal grains cultivated, and the wheat is considered superior to that of the United States. Tobacco, hemp, and flax are also produced, and the grape, peach, and other fruits of Central Europe grow abundantly, especially in Western Canada. There are no manufactures of any importance in Canada; but paper, corn, and saw mills, as well as tanneries, breweries, and pearl-ash factories are numerous. Quantities of sugar are also made from the sap of the maple tree; and in Montreal and other places are several cloth factories.

Canada carries on an extensive trade with Great Britain, the West Indies, and the United States. The exports are pot and pearl ash, wheat, flour, and timber to Great Britain; beef, pork, beer, grain and flour to the West Indies; timber, wheat, and live-stock to the United States. The exports to Great Britain amount to £2,600,000; and the imports, which consisted chiefly of coals, metals, and manufactured goods, to nearly as much. The imports from the United States are chiefly rice, beef, pork, and tobacco; and from the West Indies, sugar, coffee, and rum.

The internal communication in Canada is very efficient. It consists of rivers, lakes, roads, canals, and railways. Vessels of considerable burden can now go from the Gulf of St Lawrence to the western extremity of Lake Superior, and a line of railway now extends from Point Levi, opposite Quebec, to Detroit; and it is intended to extend the line from Levi to Halifax on the coast of the Atlantic. The magnificent Victoria bridge, upwards of two miles in length, which crosses the St Lawrence at Montreal, connects the lines on the opposite sides of the river.

The constitution of Canada consists of a Governor and Legislative Council appointed by the Sovereign, and an elective House of Assembly. The colony is divided into the four Protestant dioceses of Quebec, Montreal, Toronto, and Huron. Toronto is situated on the shore of Lake Ontario, and is the seat of a University. The greater part of the population of Lower Canada are Roman-catholics.

New Brunswick lies to the eastward of Canada, and is bounded on the north by the River Ristigouche and Chaleurs Bay; on the east by the Gulf of St Lawrence; on the south by the Bay of Fundy; and on the west by River St Croix, which flows into Pasamaquoddy Bay, and the meridian of $67^{\circ} 53'$ west. It has an area of about 30,000 square miles, with a population of 200,000, consisting of British and French settlers, and a few Indians. Along the shores of the Gulf of St Lawrence the country is low and sandy; but about twelve miles inland it begins to rise, and the interior is much diversified with picturesque hills, fertile valleys, and sheltered plains. The climate and minerals have already been noticed. The greater portion of the colony is still covered with timber, which forms the chief article of export. The principal rivers are the St John and the Miramichi, the St John being much the larger. It rises in the United States, and, flowing through Lower Canada, enters New Brunswick, and, turning south-east, empties itself into the Bay of Fundy after a course of 400 miles. At its mouth stands the town of *St John's*, the chief port in the colony; and about eighty miles from its mouth is *Fredericton*, the capital. The **Miramichi** rises in the interior of the province, and flows westward into the Gulf of St Lawrence. At its mouth stand the towns of *Chatham* and *Newcastle*. The other principal places in the colony are *St Andrew's* on Pasamaquoddy bay, and *Bathurst* on the Bay of Chaleurs. The chief exports are timber, dried fish, coals, and grindstones; the imports, manufactured goods and colonial produce. The colony is under a Lieutenant-governor assisted by Legislative and Executive Councils, and an elected House of Assembly. There is an English Protestant bishop at *Fredericton*.

Nova Scotia and Cape Breton Island.—Nova Scotia is a peninsula on the south-east of New Brunswick, and connected to it by an isthmus only eight miles broad: it has an area of 15,600 square miles. Cape Breton Island lies to the north, and is separated from the peninsula by a

channel called the Gut of Canso. It has an area of 3125 square miles. The climate and productions are similar to those of New Brunswick, the timber trade and fisheries forming the chief employment of the people. The population is 276,000. The chief town, *Halifax*, on the Atlantic coast, possesses an excellent harbour. Cape Breton Island has a population of 36,000: the chief town is *Sydney*. The island and peninsula form one colony under a Lieutenant-governor, with a Council and House of Assembly.

Prince Edward Island.—This is a small island in the Gulf of St Lawrence, and separated from New Brunswick and Nova Scotia by Northumberland Strait. It is long and narrow in shape, and has an area of 2130 square miles. The island is level, the soil fertile, and the climate mild, equable, and healthy. Agriculture forms the chief employment of the people, and agricultural produce is supplied to New Brunswick and Nova Scotia. The population is about 62,000, of whom the greater portion are of Scotch descent. The fisheries are valuable, and include the cod, herring, mackerel, oyster, and lobster. The capital of the colony is *Charlottetown*, on Hillsborough Bay. *Georgetown*, upon the east coast, has also considerable trade. This island forms a distinct colony, governed like the others; it is included in the diocese of Nova Scotia.

There are two other subjects to be noticed before concluding this chapter,—the Hudson Bay Company, and the Inter-Oceanic Railway.

The Hudson Bay Company.—This company was established in 1670, and its operations extend not only over British North America, but over Oregon, Russian America, and the Sandwich Islands. It commands the service of 3000 agents, and gives employment to 100,000 savage Indians. The trade is carried on by barter, the standard of value being the beaver skin. A silver fox is equal to four or five beavers, and a beaver is equal to two martens.

A musket is worth twenty beavers. Goods to the value of £60,000 are annually distributed among the Indians, in return for which, furs of a value sufficient to pay $12\frac{1}{2}$ per cent. profit to the Company, are received. The greater part of Rupert's Land, as we have already seen, is quite incapable of cultivation, and if it were not a hunting ground it would be worthless. The Company protect the fur-animals, and under their protection they actually increase in numbers. If, then, the Company were abolished, the greater part of Rupert's Land would become a barren wilderness. But at the same time it must be admitted, that there are extensive tracts suitable for colonization, which might be taken from under the jurisdiction of the Company. There is already a flourishing settlement at Red River, and the whole basin of the Saskatchewan possesses a fertile soil. Last year (1863), the Hudson Bay Company was remodelled; and the new Company, while prosecuting the fur-trade as before, intends to offer every facility to colonists, and to promote, by every means in its power, a communication between British Columbia and Canada, across the continent of America.

Inter-Oceanic Railway. — A railway between the Atlantic and the Pacific has long been thought of. There is already communication between the Atlantic and Montreal through the northern states of the Union; and it is proposed to extend the line from Point Levi, through New Brunswick and Nova Scotia, to Halifax. The most direct line to the Pacific, therefore, would be from Montreal up the valley of the Ottawa, thence to the northern shore of Lake Superior, through the Red River Settlement and the basin of the Saskatchewan, and so across the Rocky Mountains to New Westminster. We have already mentioned that the Vermilion Pass, which lies in the line we have indicated, is less than 5000 feet in elevation, and it would present no serious difficulty in carrying out the railway. The benefits of such a line would be immense; it would develop the resources of all the country through which it passed; it would afford an outlet to the produce

of the Red River and any other settlements which might be formed; and would not only shorten the distance from this country to British Columbia, but also to China and Australia.

CHAPTER VIII.

BRITISH POSSESSIONS IN AMERICA:—VANCOUVER ISLAND.—
NEWFOUNDLAND.—BERMUDAS.—HONDURAS.—BRITISH
GUIANA.—THE FALKLAND ISLANDS.

Vancouver Island lies on the western coast of British North America, between the parallels of 48° and 51°. It is separated from the mainland by the Gulf of Georgia, which, at its northern entrance, is called Queen Charlotte Sound, and at its southern entrance the Strait of Juan de Fuca. The island is about 280 miles long, and from 40 to 50 miles broad: the area is about 14,000 square miles. From what is known of the interior, it appears to be fertile, well-wooded, and diversified with hills and prairies. The climate is warmer than that of England, and is divided into wet and dry seasons. From October to March there is rain and snow: from March to October is the dry season. Speaking generally, the climate is healthy and agreeable.

In 1849, the island was granted to the Hudson Bay Company, under the express condition of colonizing it; but very little was done in this way until quite recently, when the discovery of gold in British Columbia gave an impetus to the prosperity of the island. The governor is appointed by the Crown on the nomination of the Company: **Fort Victoria**, at the south-eastern extremity of the island, is the seat of government. A little to the west of Victoria is Esquimault Harbour, one of the finest in the Pacific, and this will, no doubt, in time become the port of Victoria.

About 60 miles to the north of Victoria, and opposite

the mouth of the Fraser River, is *Nanaimo*, where coal of excellent quality is worked, and to which vessels engaged in the North Pacific already resort as a coaling station. Copper, lead, iron, and coal, have been found, and limestone is abundant.

The agricultural capabilities of the island are very great, and the soil produces excellent crops of wheat, barley, oats, peas, turnips, and potatoes. Numerous fur-animals, including beavers, racoons, land-otters, and sea-otters are also found in the island; and fish abound on all parts of the coast. The native Indians are described as a fine race of men, and number about 12,000: the number of white settlers is rapidly increasing.

Newfoundland is a large island at the entrance to the Gulf of St Lawrence. It is exceedingly irregular in shape, with a bold rocky coast, deeply indented with excellent harbours, and has an area of about 36,000 square miles. At the south-eastern extremity of the island is the peninsula of *Avalon*, connected to the rest of the island by a narrow isthmus, on either side of which are Placentia and Trinity bays. This peninsula is the most populous part of the colony, and, indeed, all the settlements are confined to the coast. The interior of the island is not well known; but it seems to consist of a succession of hills and valleys, with numerous rivers and lakes, some of the latter being of considerable size. The soil is in general barren: there are numerous mossy tracts, and, except along the banks of rivers, very little timber. The minerals comprise coal, iron, copper, lead, and other metals; besides abundance of granite and building-stones. The wild animals include deer, bears, wolves, martens, and foxes.

The climate is severe, but healthy. The winter lasts from the beginning of December to the middle of April: frosts are severe, but the snow does not lie long on the ground. The summer is short and warm, and the sky often bright and cloudless, except during May, when dense fogs prevail. Agriculture employs a large portion of the inhabitants, and there are abundant crops of grain

and potatoes; but the fisheries give the most general employment. The Banks of Newfoundland swarm with every variety of fish. These banks form an extensive submarine elevation on the south and south-east of the island. They extend over a distance of 600 or 700 miles. The Great Bank, which lies most to the east, measures about 300 miles from north to south, and the water upon it varies in depth from 15 to 80 fathoms. The fisheries here are chiefly in the hands of the French and Americans, the English preferring the fisheries round the coast, where cod is equally abundant. The cod-fishery begins in June, and lasts until the middle of October. In the early part of the year the Newfoundlanders are engaged in capturing seals.

The aboriginal inhabitants of the island confine themselves to the interior, but they are not supposed to be numerous. The settlers consist principally of natives of Ireland and the Channel Islands and their descendants, though there are a great many from other parts of the United Kingdom. The present population is above 120,000. The constitution is similar to that of the other North American colonies. There is an English bishop, but the majority of the settlers are Roman-catholics. The exports consist chiefly of the produce of the fisheries, and include dried fish, fish-oils, and seal-skins. The imports consist of salted provisions, flour, and various articles of British produce. *St John's*, the capital of Newfoundland, is the only town of importance on the island: it has a population of about 11,000 persons. To the southward of *St John* is *Cape Race*, which has telegraphic communication with the mainland; and vessels bound for Europe generally call here to receive the latest telegrams.

The *Bermudas* form a small archipelago in the Atlantic, about 580 miles south-east of *Cape Hatteras*. There are, it is said, 365 rocks and islets, but only five of these are of any size, the largest being *Long Island*. The group is surrounded on the north, west, and south by formidable coral-reefs, the only reefs of this description occurring in

the central Atlantic. The islands are very low, the highest point being only 180 feet above the sea. The soil is fertile, and the climate a perpetual spring. Fruits and vegetables grow in great abundance; the arrow-root is said to be superior to that of any other place, and the orange-orchards are extending and improving. The adjoining seas are stored with fish: many whales are taken in the season between March and June, and during the summer months numbers of turtle are caught.

The area of this group of islands is about 22 square miles; the population about 11,000, of whom rather more than half are persons of colour. There is a Governor, assisted by a Council, and an elected Legislative Assembly.

The capital of the colony is **Hamilton**, situated upon Long Island. The town of **St George**, on an island of that name, possesses an excellent harbour, and is strongly fortified. There are no springs or streams of fresh water on the islands, and the rain is collected in tanks, with which every house is provided. The Bermudas lie in the route of vessels homeward bound from the West Indies, and are in a situation suitable for the re-fitting of ships of war engaged in the West Indian and American seas. A convict establishment, therefore, was established on these islands, in order to make improvements in St George's harbour, and to carry out some other public works. Among other improvements, an extensive dockyard has been constructed on Ireland Island, which lies to the west of the principal island, and strong fortifications have been erected by the convicts. The Bermudas are included in the diocese of Nova Scotia.

British Honduras, or *Belize*, lies on the east coast of Central America. It is bounded on the north and north-west by Yucatan, on the south and south-west by Guatemala, and on the east by the Gulf of Honduras. Its western boundary is not well defined, but the whole territory probably comprises an area of 14,000 square miles. The seacoast is low and swampy, but the interior is hilly; and there are two well-defined ranges running in a north-

east and south-west direction, between which flows the river Belize, the only river of any importance in the colony. The mean annual temperature is about 80°; but from June to April the heat is tempered by sea-breezes. The rainy season occurs between June and September. The greater part of the country is covered with forests of fine timber, including pines, cedars, iron-wood, log-wood, and mahogany: and among the wild animals are ounces, panthers, tapirs, armadilloes, and monkeys.

Honduras was transferred by Spain to England in 1670; but its occupation was contested by Spain at different times until 1798, since which period it has remained in the undisputed possession of Great Britain. The population amounts to 25,000, and consists chiefly of negroes, who were brought into the country as slaves. The white portion of the inhabitants are engaged in commerce,—**Belize**, at the mouth of the river of that name, being the centre of trade. The negroes are engaged in cutting down the timber, and in the fisheries. The chief exports from Honduras include mahogany, rosewood, tortoise-shell, indigo, and sarsaparilla. The territory is a dependency of Jamaica, and is governed by a superintendent.

British Guiana.—This colony lies on the north-east coast of South America, and within eight degrees of the equator. The coast extends from the mouth of the Corantyn to the mouth of the Orinoco, a distance of 280 miles; and the province extends inland for about 400 miles: the total area is estimated at 76,000 square miles. The district along the seacoast is on a level with the high-water of the sea, and is covered with sluices and embankments. This level tract stretches from 10 to 40 miles inland, and is backed by a chain of low sand-hills, the highest not exceeding 200 feet. The country thence rises in a succession of terraces into the interior, these terraces being separated by parallel ranges of mountains which run in an east and west direction. The principal range, called **Sierra Pacaraima**, is nearly in the centre of the country; and its highest summit, **Roraima**, has an

elevation of 7500 feet. In the north part of the colony is the **Sierra Imataca**, and in the south-east is the **Sierra Acarai**, which forms part of the boundary in this direction. The principal rivers in the country flow at right angles to the mountains, and, in breaking through the various ranges, form numerous cascades. The longest river is the **Essequibo**, which is about 600 miles in length, and forms a wide estuary at its mouth, studded with low beautifully-wooded islands. The **Corentyn**, which forms the eastern boundary, is the next in length; and the **Berbice** and **Demerara** are 360 and 200 miles long respectively.

The climate is strictly tropical, averaging 81°. There are two rainy seasons, one from December to February, and the other from June to August. In the dry seasons the climate is very agreeable, and in the interior is said to be healthy for Europeans. One-half the country is covered with forest containing magnificent trees, among which we may mention the **Mira-tree**, which grows to the height of 130 or 150 feet, and the timber of which is said to be equal to the teak of the East Indies. All the animals of tropical America are found in Guiana,—jaguars, tapirs, sloths, monkeys, and alligators; and we may add parrots, humming-birds, and flamingoes. Reptiles and insects are also very numerous.

The population, exclusive of the native Indians, amounts to about 155,000, the greater portion of whom are freed negroes. The chief products of the colony are sugar, coffee, and cotton; tobacco, indigo, and ginger are also grown to a less extent. These, along with rum, timber, and cocoa-nuts, form the chief exports; in return for which the colonists receive British produce. The exports to Great Britain amount to about £1,500,000; and the imports to about £500,000.

The principal settlements are on the banks of the Demerara and Berbice. The capital, **Georgetown**, is a short distance from the mouth of the Demerara, and has a population of about 25,000. **New Amsterdam**, at the

mouth of the Berbice, has about 5000 inhabitants. The colony is under a Governor appointed by the Crown, assisted by a Colonial Assembly.

The Falkland Islands form a group of about 200 islands, lying about 200 miles to the east of the Straits of Magellan. The two principal are East and West Falkland, and they are separated by a channel called Falkland Sound. The area of the whole group is estimated at about 6000 square miles. The shores are rocky and much indented, some of the inlets forming excellent harbours. The western island has a greater average elevation than East Falkland, but it is on the latter that the highest elevations occur. The principal range of hills, called **Whickham Heights**, rises in some places to an altitude of 2000 feet. The climate is very similar to that of England, but is more equable, and is remarkably healthy. The soil for the most part consists of barren moorland, though in some of the valleys fertile spots are found. There are no trees but a few bushes, and neither grain nor fruit will ripen. The grasses grown on the islands are, however, very valuable, and there are a great variety of sweetly-scented flowers. The country is well suited for grazing purposes, and green crops also seem to thrive. In East Falkland there are a great number of wild oxen and horses, and rabbits and pigs are plentiful on most of the islands. There are no reptiles found here; but among birds there are ducks, geese, snipes, hawks, vultures, petrels, gulls, and the albatross.

A British settlement, called **Stanley**, has been formed on the coast of East Falkland, and its port is free to vessels of all nations. Ships may call here and obtain fresh water, vegetables, and fresh meat, at very moderate charges. The harbour, called Port William, may be easily entered, is well sheltered, and affords good anchorage. Many French and American vessels, engaged in the South Sea whale and seal fisheries, call at these islands. The total number of settlers is nearly 600.

CHAPTER IX.

THE WEST INDIES. — GENERAL DESCRIPTION. — THE
BAHAMAS.—JAMAICA.—VIRGIN ISLANDS.—BARBUDA.—
ANTIGUA.—BARBADOES.—TRINIDAD.—FUTURE PROS-
PECTS.

The West Indies are an extensive system of islands to the eastward of Central America, stretching from the mouth of the Orinoco to the peninsula of Florida, and lying between the parallels of 10° and 28° north latitude. They are divided into three distinct groups, called respectively the Lesser Antilles, the Greater Antilles, and the Bahama Islands. The Lesser Antilles extend, in the form of a crescent, from Trinidad to the Virgin Islands; and they are subdivided into the Windward and Leeward Islands, the former lying to the south, and the latter to the north of Dominica. The Greater Antilles include the four largest and finest islands in the archipelago,—Porto Rico, Hayti, Jamaica, and Cuba. These all lie to the north and west of the Lesser Antilles. The Bahama group forms the most northern portion of the system, and is composed of a number of low uninteresting islands of little value. England possesses several of the Lesser Antilles, Jamaica—one of the Greater Antilles,—and the whole of the Bahama Islands. The total area of the West Indies is about 95,000 square miles, of which the Greater Antilles occupy about 80,000 square miles. The total area of the islands belonging to Great Britain exceeds 13,000 square miles.

General Description.—The Antilles are generally considered by geologists to be the remains of a mountain-chain which once connected the continents of North and South America. The Caribbean Sea and Gulf of Mexico would seem to cover a vast sunken area; and the several islands of the archipelago are but the tops of a mountain-range still rising above the surface of the water. Nearly

all the islands of the Greater and Lesser Antilles are mountainous; in some of the larger islands the mountains attain an elevation of 8000 feet, and many of the Lesser Antilles rise to half that height. The islands generally have rocky and deeply indented shores, especially towards the east; and in the interior there is generally either a single mountain or a mountain-group. Cuba and Hayti possess gold, silver, and other metals; but there are no minerals of any importance found in the smaller islands.

The climate of the West Indies, as might be expected, is very hot; and though it is modified by the sea-breezes, and also by the elevations of the land, yet in the Lesser Antilles it averages about 80°. There are two rainy seasons; the first, which commences in April, lasts about six weeks; the second begins in July, and is ushered in by terrific thunderstorms and violent winds. In Jamaica the short dry season occurs in August and September. All the islands of the Lesser Antilles, with the exception of Trinidad and Tobago, are in the region of those hurricanes which sometimes cause such damage by their violence; and earthquakes are more or less common in all the islands. The climate of the West Indies is considered healthy during the dry seasons, but during the rainy seasons various kinds of fevers are very prevalent.

The vegetation of these islands is rich, varied, and luxuriant: and the shores on the eastern side of the Lesser Antilles have a more verdant appearance than the shores on the west, owing to their exposure to the trade-winds of the Atlantic, which come laden with fertilizing showers. The principal articles cultivated in the West Indies are sugar, coffee, pimento, and cotton, as well as indigo, ginger, and tobacco. Plantations of banana and plantain are common on all the islands; and among fruits there are the pine-apple, the pomegranate, the mango, the guava, the orange, lemon, and bread-fruit. Maize is cultivated pretty generally, and yields abundant crops; and ground-provisions—under which name are included the yam, manioc, and sweet potato—grow freely.

There are no wild animals of any size on these islands, except monkeys and wild hogs. Caymans, lizards, and snakes are plentiful, as are also insects. Parrots, flamingoes, and humming-birds are common; and fish and turtle abound. Cattle, horses, and other domestic animals have been introduced from Europe.

The total population of the West India Islands is about 3,500,000, of whom more than one half are negroes. The other half is made up of white settlers, *creoles*, or white persons born in the West Indies; and *mulattoes*, or those of mixed parentage. The population of the British portion of the West Indies amounts to about 900,000. Negroes were first introduced into the West Indies from Africa about the beginning of the seventeenth century, and for a long time the slave-trade was carried on by England as well as other nations. In 1806, the traffic was declared unlawful by the British Parliament, and since then various other European nations have renounced the slave-trade. In 1834, the people of England paid twenty millions sterling to the slave-owners in the various colonies, and slavery was abolished throughout the British Empire. The negroes in the British West Indies are, therefore, in a state of freedom, and work as free labourers.

To give an account of each island belonging to Great Britain, separately, would be needless repetition, and we have already, in a previous chapter (p. 240) given the area and population of each island, with the date of its acquisition; we shall here, therefore, only very briefly describe some of the principal islands, and, in so doing, shall commence with the Bahama group, which differs, in many points, from either the Greater or Lesser Antilles.

The **Bahama Islands** are a group of about 500 islands, lying to the north-east of Cuba. They extend from north to south for a distance of about 600 miles, and lie between the parallels of 27° 31' and 21° north latitude: the total area of the group is about 3000 square miles. Many of the islands are mere rocks, and only about twenty are inhabited; they are generally of a long and narrow form,

and with one exception—the island of Inagua—are low and flat. They are formed of calcareous rock, covered with a light sandy soil, which is found suitable for the growth of various fruits. The sea to the eastward of the Bahamas is very deep, but on the west side there are a number of coral banks; and indeed the whole group, with the exception, perhaps, of Inagua, appears to be of coral formation.

The climate ranges, in general, from 80° to 90°, though in winter it sometimes descends as low as 60°; with moderate care, however, it is suitable to European constitutions. Some of the islands are barren, but others are well-wooded, the principal trees being mahogany, satin-wood, *lignumvitæ*, cedars, and pines. The woods give shelter to wild hogs and to a small animal called the agouti, which seems to be a cross between a rat and a rabbit: turtles abound on the shores. In the more southern islands there are natural saltpans of great value, which supply a considerable quantity of that mineral.

San Salvador, one of the Bahamas, was the first land discovered by Columbus, in his first voyage, 1492. At this time the islands were inhabited by a mild and inoffensive race of Indians. These, the Spaniards afterwards removed to work in the mines of St Domingo, or to act as pearl-divers in Cumana. In a very short time the race became extinct; and the islands remained destitute of inhabitants for more than a century, when they were colonized by the English (1629.) After this, the islands were alternately in the hands of the English and Spaniards until 1783, when they were finally ceded to Britain. The present population is about 35,000, of whom fewer than one-fifth are whites.

A large number of the inhabitants are engaged in the occupation of "wreckers"—that is, they give assistance to vessels that have suffered, or are in danger of, shipwreck. They are licensed by government, are excellent sailors, and prompt and intrepid in danger. Other of the inhabitants are engaged in agriculture, and raise oranges, lemons,

limes, maize, and ground-provisions for their own use; and a little cotton for export. Cattle also are reared in great numbers. The Bahamas have a legislature, consisting of a Governor and Council appointed by the Crown, and a House of Assembly. There is an English bishopric in the islands. The principal town in the archipelago and the seat of government is **Nassau**, which stands upon the island of New Providence.

Jamaica, the most important of the British West India Islands, lies to the south of Cuba. It measures about 150 miles from east to west, with an average breadth of from thirty to forty miles; its area is 6400 square miles. "The general appearance of the island, on approaching it, is extremely beautiful. On the north it rises into hills of gentle ascent, covered with pimento groves, and a brilliant verdure, and intersected by vales which exhibit the most romantic scenery; while on the south it presents abrupt precipices and inaccessible cliffs, the general effect being heightened by the profusion of streams which pour from every valley, and which frequently project themselves from the overhanging rocks into the ocean.—[*Blackie: Imperial Gazetteer.*]

The greater portion of the island is covered with mountains, the principal range being the **Blue Mountains**, which extend in an eastern and western direction near the centre of the island, and attain an elevation of 7000 feet. There are numerous rivers; but the only navigable one is the **Black River**, which empties itself on the south-west coast. The climate is hot, and in the low plains, lying on the coast, the yellow fever is prevalent: at the elevation of 2500 feet, however, fever is unknown.

The population is about 450,000, of whom three-fourths are negroes, and the remainder mostly mulattoes. The principal productions of the island are sugar, rum, molasses, coffee, and pimento; with cotton, indigo, ginger, tobacco, and logwood in smaller quantities. The imports are chiefly articles of British produce, many of which are re-exported to Cuba and other neighbouring countries. The largest

town in Jamaica is **Kingston**, the principal port; it is connected with **Spanish Town**, the seat of government, by rail. The constitution is similar to that of the Bahamas. The diocese of Jamaica includes also the Bahamas, and Honduras. To the north-west of Jamaica are three little islands called respectively Grand Cayman, Little Cayman, and Cayman Brack. They belong to Britain, and are dependencies of Jamaica.

The Virgin Islands form a small archipelago at the northern extremity of the Lesser Antilles. They comprise about 100 small islands, which are divided among the English, Danes, and Spaniards. England possesses about fifty,—the three principal of which are *Tortola*, *Virgin Gorda*, and *Anegada*. They are under a lieutenant-governor, and are included in the diocese of Antigua.

Barbuda.—This small island lies in the northern part of the Lesser Antilles. It is low, level, and fertile, and well covered with woods which are stocked with deer and game. The climate is healthy, and the air mild and pure. No sugar is grown, and the inhabitants are chiefly engaged in breeding cattle. The island is the private possession of the Codrington family. There is no harbour, but ships anchor in a roadstead on the western side.

Antigua lies to the south of Barbuda, and has an area of about 108 square miles: the shores are rocky and deeply indented, and the interior consists of "hill and dale, green fields, gorgeous flowers, and cliffs festooned with elegant intertropical plants." The climate is dry and healthy, and the produce considerable, more than half the surface of the island being covered with sugar-plantations. The chief exports are sugar, rum, and molasses. The population is about 36,000. **St John**, the capital of the island, stands on the north-east coast. **English Harbour**, on the south coast, is an important naval station, and one of the finest harbours in the West Indies. The governor of Antigua is governor-general of the Leeward Islands, which include Anguilla, St Christopher, Nevis, Montserrat, Dominica, and the Virgin Islands. Antigua is also the seat of an English bishop.

Barbadoes.—This island, which lies a little to the east of the main chain of the Antilles, is, next to Jamaica, the most valuable of the British possessions in the West Indies. The area of the island is about 166 square miles: the highest point, **Mount Hillaby**, has an elevation of 1145 feet, and the surface is generally diversified, and in some places picturesque. The climate is considered the healthiest in the West Indies; from its position it is open to the sea-breezes, and the soil is well drained. Coal is found in some parts, as well as various clays and ochres. The woods have been cleared away in a great measure; and, with the exception of wild hogs, there are no wild animals of any importance.

The population of Barbadoes amounts to 152,000; about 16,000 of whom are whites. The staple productions are sugar, arrow-root, aloes, and cotton. The capital of the island is **Bridgetown**, which stands on the south-west coast. Near the eastern side of the island is *Codrington College*, founded by Colonel Codrington, a native of Barbadoes. The governor of Barbadoes is the governor-general of the Windward Islands, which include St Lucia, St Vincent, Grenada, Tobago, and Trinidad. These islands are also included in the diocese of Barbadoes.

Trinidad.—The largest of the Lesser Antilles is separated from the north-east coast of Venezuela by the Gulf of Para. On the north-west and south-west, the island approaches very close to the mainland, and the two narrow channels between are known, respectively, as the *Dragon's Mouth*, and the *Serpent's Mouth*. The island is of an oblong form, and has an area of 2020 square miles. The mountains cross the island in three ranges which run east and west. The higher ranges run along the north and south coasts, and a lower range crosses the middle of the island. Between these ranges are extensive grassy plains, plentifully supplied with water; while the hills are mostly covered with dense forest, containing excellent timber, among which may be mentioned the red cedar and a variety of palms. Perhaps the greatest curiosity in the

island is a lake of pitch, about a mile-and-a-half in circumference, which lies on the south-west coast. At the sides of the lake, the pitch is cold and hard, but in the centre it is seen boiling up in a liquid state. The climate of Trinidad is healthy, and the soil very fertile.

Among the animals found on the island are a species of deer, opossums, armadilloes, porcupines, lizards, ant-eaters, sloths, tiger-cats, and monkeys. Among birds we may mention partridges, woodcocks, parrots, flamingoes, pelicans, vultures, and vampires. The population amounts to 84,000—the few whites being mostly of Spanish descent. The chief produce of the island consists in sugar, rum, molasses, a considerable quantity of cocoa, some cotton, and a little ginger. **Port of Spain**, the capital, stands on the western coast.

Future Prospects.—The chief exports from the West Indies are sugar, molasses, rum, cocoa, coffee, pimento, and arrow-root. Of these, **Sugar** is by far the most important article, for the West Indies supply us with more than any other part of the world. The **Cocoa** comes chiefly from Trinidad, and the **Pimento** from Jamaica. The value of the total imports from the British West India Islands amounts to about £3,000,000, and the imports of British produce and manufactures exceeds £2,000,000. Since the emancipation of the negroes, the trade with the West Indies has not improved so much as could have been wished, and in the case of some islands, such as Jamaica for example, it has declined. This may easily be accounted for. The staple product of the West Indies is sugar: before the emancipation, negroes were compelled to work in the plantations, without pay, and under the lash. When the slaves recovered their freedom they refused, for wages even, to engage in an employment which in their minds was associated with such misery. Add to this, that in all the islands, with the exception of Antigua and Barbadoes, there were large tracts of waste ground, where the negroes could squat, and just raise sufficient produce to keep in

life. White men could not work in the plantations, owing to the excessive heat, negroes would not ; it is no wonder then that many of the plantations were abandoned, and that several planters were ruined. In Barbadoes there were no waste lands, and consequently the emancipated negroes were obliged either to work or starve ; hence we account for the flourishing state of that colony. As population increases in the other islands, the negroes will be compelled to work for subsistence, and, no doubt, through time, they will be taught habits of forethought and industry. In the meantime, the deficiency of labour is made up by promoting the immigration of coolies from India and China, who receive wages for their work. This plan has been tried in British Guiana and some of the West India Islands, and has been attended with the best results.

We may remark here, that at the commencement of the present century, **Cotton** formed, next to sugar, the chief import from the West Indies. But of course the very same causes, which hurt the sugar-plantations, hindered the production of cotton. The southern states of America thenceforth became the great cotton-field for the world ; but the West Indies possess every facility—except labour—for producing this article in great abundance, and of the finest quality. Sea-island cotton is indigenous to the West Indies ; and it is computed that in British Guiana and the West Indies there are six million acres of land capable of producing it. It is probable that the Association to which we have already referred (p. 263) will shortly endeavour to promote, in the West Indies, the growth, on a large scale, of the raw material so essential to our greatest manufacture.

CHAPTER X.

AUSTRALIA. — PHYSICAL GEOGRAPHY. — SURFACE AND MINERALS.—RIVERS AND LAKES.—CLIMATE AND PRODUCTIONS.—PROGRESS OF DISCOVERY.

The continent of Australia extends from $10^{\circ} 42'$ to $39^{\circ} 9'$ south latitude; and from 113° to $153^{\circ} 47'$ east longitude. Its extreme breadth from Cape York to Cape Wilson is about 2000 miles, and its length from east to west is about 2400. The whole area is estimated at 3,000,000 square miles; and the length of coast-line is about 8000 miles.

Surface and Minerals.—The physical geography of Australia is rather peculiar; it seems to be an immense island raised from the bottom of the sea by upheaving forces acting round the margin. Hence the coast-regions—especially on the east and west—are rugged and mountainous, and the prevailing stratified rocks belong to the primary formation; while the interior consists of vast tertiary plains which would appear, at no remote period, to have formed the bottom of an immense inland sea.

The principal mountain-chains in Australia seem to run in one common direction from north to south. The longest and most important range is parallel to the east coast, at a distance from the sea varying from 30 to 90 miles. It commences at Cape Wilson, and continues, with decreasing elevation, as far as Cape York. The southern portion of the chain is known as the **Australian Alps**, the highest summit of which, **Mount Kosciusko**, rises 6500 feet above the sea. Further north the range is known as the **Blue Mountains**; so called from their assuming a beautiful blue colour when viewed from a distance. **Mount York**, the highest peak, has an elevation of 3440 feet. Though this range is not so high as the Australian Alps, yet it exceeds it in rugged grandeur. It presents

numerous rents, chasms, and precipices,—walls of naked rock sometimes rising to the height of 2000 feet. North of the Blue Mountains is the **Liverpool Range**, the greatest elevation—**Mount Lindesay**—being 5700 feet. Still further to the north, the mountain-chain is but imperfectly known.

The country between these various ranges and the sea is an undulating and well-watered region, penetrated in part by spurs from the main chain. To the west of the chain there is a succession of high lands, varying in elevation from 1000 to 2000 feet, and distinguished by the names of *Brisbane Plains*, *Darling Downs*, and *Liverpool Plains*. To the westward of the Blue Mountains are several isolated summits, among which is the peak of **Canobolas**, 4631 feet in height. To the west and south-west of the Australian Alps, the country is more generally diversified than in any other part of Australia, and some of the ranges here are known as the **Australian Grampians** and the **Australian Pyrenees**. The Grampians commence near the south coast at Portland Bay, and run northward; the summit of **Mount William**, in this range, is 4700 feet in height. The Pyrenees lie to the east of the Grampians, and run parallel to them.

From Cape Jarvis—at the south-eastern extremity of St Vincent's Gulf—a range of mountains runs northward to Lake Torrens. This bears the general name of **Flinders Range**, and contains some summits exceeding 3000 feet in elevation. Chains of hills also appear to extend along the west coast of Australia, though they are of no great elevation. The southern portion is known as the **Darling Range**. As far as is at present known there are no active volcanoes in Australia, but several extinct ones; and in the southern part of the Liverpool Range, there is a bituminous hill called **Mount Wingen**, which exhibits a red heat at the depth of about four fathoms, and emits sulphureous vapours.

Australia equals any other division of the globe in the value of its minerals. Gold is found in greater or less

abundance on the whole inland slope of the great eastern range, but especially in the Australian Alps, and in the hilly country lying to the west. **Copper** is found in the district eastward of Spencer Gulf in richer quality and in greater abundance than in any other part of the world. **Lead** is found in the same locality, and also in Western Australia. **Coal** has been met with in the district of Hunter's River, which lies on the east coast, near the southern extremity of the Liverpool Range, and also in the neighbourhood of Swan River on the west coast. Iron also, as well as tin, marbles and building-stones, has been met with in various parts.

Rivers and Lakes.—Australia is deficient in fresh water, whether in the form of rivers or lakes. The lakes are pretty numerous, but they are in general salt, as are many of the rivers, and of the latter the River Murray is the only one of any considerable length. Many of the rivers never reach the sea, but flow inland, and are lost in salt marshes. On the east coast there are several streams which have their sources in the neighbouring mountain-chain. The principal of these—commencing on the south—are the Shoalhaven, Hawkesbury, Hunter, Hastings, Clarence, Richmond, and Brisbane. The **Hawkesbury** rises in the Blue Mountains, and passing the town of *Windsor*, where it is navigable for vessels of 100 tons burden, it empties itself into Broken Bay, 30 miles north of Port Jackson. **Hunter River** is navigable 50 miles from its mouth, where stands the town of *Newcastle*. **Richmond River**, still further north, is navigable 70 miles from its mouth. The **Brisbane** empties itself into Moreton Bay, and drains a tract of great beauty and fertility.

On the south coast, from Spencer Gulf to King George's Sound—a distance of 1500 miles—there is not a single river. On the west coast the principal stream is the **Swan River**, about 180 miles long, on which stands the town of *Perth*. On the north-west and north are the Fitzroy, Victoria, Adelaide, Alligator, Roper, Albert, and Mitchell.

The three last mentioned flow into the Gulf of Carpentaria. The **Albert** was ascended by Captain Stokes to the distance of 10 miles; the water had then a depth of 10 or 12 feet, and the width of the river was about 200 yards. The scenery is described in the most glowing terms. But all the rivers yet mentioned drain but the margin of the continent: the only really large river in Australia is the **Murray**.

The **Murray** rises in the Australian Alps, and after flowing for some distance towards the west, it is joined by the **Murrumbidgee**, which brings with it the waters of the **Lachlan**. The **Murray** is now 350 feet broad, and has a depth varying from 12 to 20 feet. A little further west it receives the **Darling**, which is formed by the junction of numerous streams rising on the western slope of the Liverpool range. Soon after the junction with the **Darling**, the **Murray** makes a bend to the south, and, flowing through **Lake Alexandrina**, enters Encounter Bay, after a course exceeding 1200 miles in length. **Lake Alexandrina** is an extensive sheet of water, having an area of 273 square miles. Its depth varies from six to nine feet, its water is brackish, and the narrow channel by which it communicates with the sea is dangerous. On the eastern side it is connected with **Lake Albert**, and on the south with **Lake Cooreng**—a long narrow estuary of salt water.

The **Murray** and **Murrumbidgee** are navigable from May to December, and in wet seasons throughout the whole year. Steamers ascend the **Murray** to within 150 miles of its source, and towns are rapidly springing up along its banks. The whole area drained by the **Murray** and its tributaries is estimated at 200,000 square miles.

An opinion was at one time pretty general that a large lake existed in the centre of Australia, into which the waters of several inland rivers were supposed to flow. But it seems probable now that no such lake exists, though there appear to be several swamps or salt marshes. One of these swamps occurs in the basin of the **Darling**,

and into it the **Macquarie**, which rises in the Blue Mountains, empties itself. Lake Alexandrina is another of these swamps; but, perhaps, the largest known at present is **Lake Torrens**, which lies in the form of a crescent round the northern extremity of Flinders Range. It is said to be about 400 miles long, with an average breadth of 15 or 20 miles.

Climate and Productions.—Australia lies much nearer the equator than England does, and has consequently a much higher temperature. We have already seen that the isotherm of 60° passes through Melbourne, which lies on the south coast of Australia. Further north the temperature is much higher. At Sydney the mean annual temperature is 65.8° , and at Moreton Bay 68.5° ; the portion of Australia still further north lies within the tropics. In Northern Australia the winds blow with great regularity. A north-west monsoon prevails from October to April, and a south-east monsoon from April to October. On the south coast the wind is from the west during the greater part of the year, the easterly winds only occurring from January to March. The southern half of Australia being sub-tropical is deficient in moisture (p. 52), but what rain there is generally falls in the winter season (p. 56). The irregularity of the rains is the chief defect in the climate of Australia, and, as is the case with Cape Colony, renders the rivers almost useless for navigation. The climate of Australia is, however, extremely healthy for Europeans.

The vegetable and animal productions of Australia are very peculiar. The trees are all evergreens, and consist principally of acacias, gum-trees, arborescent ferns, and gigantic nettles (p. 76). The gum-tree often attains a height of 150 feet, with a circumference at the base of from 25 to 40 feet. The most beautiful tree of the Australian forest, however, is the fern-tree, which grows to the height of 15 or 20 feet, and then shoots out its enormous leaves in every direction, each four or five feet long. Most of the trees in this continent shed their bark every year. The flowers are beautifully tinted, but gener-

ally without perfume, while sweet-smelling plants are numerous. Grasses are abundant in favoured regions; but, with the exception of a few berries, no edible fruits are indigenous to Australia, though the grains and fruits of Europe yield abundant crops. On the northern coast the vegetation resembles that of the adjacent archipelago, and tall slender palm-trees are seen in the woods.

The animals of Oceanica, as has been already remarked, form a distinct province by themselves (p. 78), and Australia forms the greater part of Oceanica. Among land animals the wild dog, or **Dingo**, is the only representative of carnivora to be met with, if we except the alligator, which abounds in the rivers on the north coast. Opossums and kangaroos are the most numerous animals, and of the latter there are several varieties. Perhaps the most remarkable animal found in Australia is the **Ornithorhynchus**, an aquatic, egg-laying mammal, with the body of an otter and the bill of a duck. Besides the animals already mentioned, there are porcupines, sloths, flying squirrels, wombats, and ant-eaters; and the domestic animals of Britain have been introduced with the greatest success. Among the native birds, the largest is the **Emu**, or cassowary, which attains the height of about six feet. Eagles, falcons, hawks, and owls are numerous, but there are no song-birds; and there is almost a total absence of those birds which are useful to man, such as fowls, turkeys, and pheasants. **Parrots**, cockatoos, and others of the same tribe are common, and are sometimes of the most beautiful plumage. The family of **Honey-suckers** are numerous; and, on the northern coast, birds of paradise are met with.

Progress of Discovery.—The aborigines of Australia belong to the Papuan race, which seems to be a subdivision of the Negro type (p. 86). The natives of Australia have a dark, sooty-brown complexion, long black hair, and a stature below that of Europeans. In many parts of the country the inhabitants are in the lowest stage of barbarism, being entirely destitute of clothing, and pos-

sessing no regular habitations. The number of the native population is unknown.

The first authentic account given of Australia was by Torres, a Spaniard, who passed through the strait that bears his name in the year 1606. In the same year a Dutch vessel explored the eastern shore of the Gulf of Carpentaria, though it was then thought to be the west coast of New Guinea. In 1616, Dirk Hartog, a Dutch commander, in a voyage to India, fell in with the west coast of Australia in the neighbourhood of Shark's Bay; and during the next twelve years various other portions of the coast were touched upon by Dutch vessels.

Between 1642 and 1644, Tasman explored a great portion of the Australian coast, and discovered Van Diemen's Land; and towards the close of that century, Dampier explored a great part of the coast on the north-west, and gave his name to the small archipelago lying to the east of the North-west Cape. In 1770, Captain Cook traced the whole eastern coast of Australia, from Cape Howe to Cape York; and within twenty years of that date, the colony of New South Wales was established. Towards the close of the last century, the channel which divides Van Diemen's land from Australia was discovered by Mr Bass, a surgeon in the English navy. He, in company with Captain Flinders, afterwards surveyed a great portion of the southern coast, and in the course of their discoveries they met with a French vessel, and from this circumstance the place of meeting was called *Encounter Bay*. Since that period other navigators have completed our knowledge of the Australian coast.

The first English settlements were formed upon the east coast, but in 1813 a passage was discovered across the Blue Mountains, and the rich pastures lying westward were occupied. In 1829, Captain Sturt explored the course of the Murray, and its feeder the Darling; and in a subsequent journey (1845), he set out from Adelaide, and penetrating half-way across the continent, came upon the barren tract called the Great Stony Desert. In the

same year, Dr Leichhardt crossed the continent from Moreton Bay to Port Essington on the north coast. Three years later he set out on another expedition, and endeavoured to cross the continent from east to west, but he never returned.

In 1855, Mr Gregory attempted to explore the interior from the north-west coast of Australia. He ascended the Victoria River, reached a watershed about 1600 feet in elevation, and continuing to advance southward for a distance of 400 miles, traversed a level, sandy, rocky country imperfectly watered by a stream running towards the south, and which terminated in a dry sterile tract, partly covered with salt marshes. This point is about 600 miles north-west from the extreme point reached by Captain Sturt in 1845. Three years later, Mr Gregory's brother set out on another expedition in search of Dr Leichhardt. He left Moreton Bay, and struck upon the Victoria River—a river in the eastern part of Australia—and following this stream, he not only was able to identify it with Cooper's Creek, but proved that Cooper's Creek empties itself into Lake Torrens. There is thus water communication from Spencer Gulf to the western portion of Moreton Bay district. Mr Gregory crossed Lake Torrens by a firm isthmus about five miles broad, which lies in a direction north-east from Mount Hopeless. The only traces of Leichhardt discovered were the remains of one of his camps, and the initial letters of his name carved on a tree.

On 1st March 1860, Mr Stuart, who acted as draughtsman to Sturt's expedition in 1845, set out from Adelaide to explore the interior of the continent. He not only reached the centre, near which he discovered a mountain, which he named Central Mount Stuart, but also advanced as far as lat. $18^{\circ} 47'$ south, and was only prevented from reaching the shores of the Gulf of Carpentaria by the opposition of the natives. Next year he renewed his attempt, and penetrated to lat. 17° south, long. 130° east; but, after *fourteen* attempts to force a passage through

thick belts of scrub, he was obliged to give up the attempt. Since that he has been more successful, and has succeeded in crossing the continent from Adelaide to the shores of Van Diemen's Gulf.

The first explorer, however, who crossed the Australian continent was Mr Burke, with his companions Wills, Gray, and King. Burke was at the head of a large expedition which left Melbourne towards the close of 1860. Leaving the main part of the expedition at Menindie, on the Darling, he pushed on to Cooper's Creek; and then, leaving there a party in charge of a *depôt* of provisions, he set out with his three companions, and succeeded in reaching Albert River, which flows into the Gulf of Carpentaria. Having thus accomplished their object, the explorers returned, but only to find the *depôt* at Cooper's Creek abandoned, and the provisions almost exhausted. Gray had sunk under the fatigue before returning to Cooper's Creek, and Wills and Burke died soon afterwards. King, however, after living some time among the natives, who treated him with great kindness, was discovered by a relief-party, and reached Melbourne in safety.

The discoveries of these explorers prove that the interior of Australia is by no means so barren as is sometimes supposed. The worst tracts which Stuart met with were three or four districts of scrub, the broadest not being sixty miles across it; and Burke, in a letter written shortly before his death, says—"We have discovered a practicable route to Carpentaria, the chief portion of which lies in the 140th meridian of east longitude. There is some good country between this and the Stony Desert. From there to the tropic the country is dry and stony. Between the tropic and Carpentaria, a considerable portion is rangy, but it is well watered and richly grassed."

CHAPTER XI.

AUSTRALIAN COLONIES.—QUEENSLAND.—NEW SOUTH WALES.—VICTORIA.—SOUTH AUSTRALIA.—WEST AUSTRALIA.—TASMANIA.

Australia, as far as it has yet been settled, is divided into five colonies; the island of Van Diemen's Land forms a sixth colony: we shall now give a brief description of each.

Queensland.—This province was erected into a colony in 1859, and embraces the northern portion of the eastern part of the continent. It is separated from New South Wales by a line drawn from Cape Danger (latitude $28^{\circ} 10'$ south) south-west, to the upper course of the Darling, and thence along the 29th parallel, until it meets the eastern boundary of South Australia. On the north and east, the colony is bounded by the ocean; on the west, its limit is not yet defined. The climate, as we might expect, is strictly tropical, the annual fall of rain about 63 inches. The high lands in the interior of the colony are well suited for sheep-farming, while the seaward slope produces all kinds of tropical fruits. The higher grounds of this slope yield two crops of the finest wheat in a year, and the swampy shore is well suited to the growth of cotton. The cotton is indeed finer than the sea-island cotton of America; but the coarser kinds will grow as well, and already several English companies are at work producing it. Besides, cotton, sugar, tobacco, indigo, arrow-root, tea, coffee, and ginger may be successfully cultivated; along with the orange, fig, and other fruits of southern Europe. The capital of the colony is **Brisbane**, pleasantly situated about 20 miles from the mouth of the river of the same name, which is navigable for a distance of 150 miles. Moreton Bay, into which the river empties itself, is a fine harbour sheltered by the islands of Moreton and Stradbroke.

New South Wales is bounded on the north by Queensland, on the west by South Australia; on the south it is separated from Victoria by a line drawn from Cape Howe to the source of the Murray, and thence along that stream to the meridian of 141° . The area of the whole colony is about 300,000 square miles, and its coast-line exceeds 700 miles in length. The coast of New South Wales consists, for the most part, of bold perpendicular cliffs, interrupted occasionally by low sandy reaches. The inlets are numerous, and form excellent harbours, among which may be mentioned Botany Bay, Port Jackson, Port Stephen, and Port Macquarie. The Liverpool Range and the Blue Mountains divide the colony into two parts,—the coast-district, watered by several streams, some of which have been already mentioned; and the plains, to the westward, drained by the Darling, Macquarie, Lachlan, and Murrumbidgee. The mineral productions include gold, copper, lead, iron, and coal. Gold is found in the valley of the Macquarie: Bathurst, on the upper part of the river, was the first part in Australia where this metal was found. Coal we have already noticed (p. 313). The climate of New South Wales is remarkably healthy; but it is subject to periodical droughts, which occur at intervals of ten or twelve years. It has about the same temperature as Natal; the annual amount of rain is about 52 inches.

After the loss of a great part of our North American colonies in 1783, the colony of New South Wales was established as a penal settlement; but transportation to this country has been discontinued for some years. The present population is about 300,000. The principal employment of the people consists in sheep-farming, and about 20,000,000 lbs. of wool are exported to England annually. The long droughts are unfavourable to agriculture; but the culture of the vine is rapidly advancing, and sugar, tobacco, indigo, and arrow-root are produced. The greater part of the trade is carried on with Great Britain, from which country manufactured goods are prin-

cipally obtained. Tea is also imported from China, sugar from the Mauritius, and grain from South Australia. New South Wales exports coal to the neighbouring colonies. The total exports from Great Britain exceed £3,000,000 annually.

The chief towns are Sydney, Paramatta, Windsor, Newcastle, and Bathurst; some of these we have already noticed. **Sydney** stands on the southern shore of Port Jackson; it is now a handsome town, with a population of 100,000. Port Jackson is one of the finest natural harbours in the world. It stretches about 15 miles inland, and has numerous branches. **Paramatta** stands at the head of the inlet; it is connected to Sydney by a railway.

Victoria.—This province was formerly a part of New South Wales, but in 1850 it was erected into a separate colony. It occupies the south-eastern corner of Australia, and has an area of 98,000 square miles. The coast, from the mouth of the Glenelg to Cape Otway, is low and unbroken, and from Cape Howe to Corner Inlet it is also low, and lined by salt lagoons. But at Wilson Promontory cliffs begin to appear, rising from 500 to 1000 feet above the sea, and the shore is indented with numerous harbours. Port Phillip has an entrance only a mile and a half wide, but it expands into a magnificent basin, thirty miles in diameter, in which the largest fleet might ride at safety. A little to the eastward is another large inlet, called Western Port.

In the interior of Victoria are two mountain-systems, already mentioned,—the Australian Alps, and the Australian Grampians. Between these are the Pyrenees, and a ridge of high ground running south-east to the Australian Alps, and forming the watershed which divides the rivers flowing into the Murray from those flowing into the ocean. Along this watershed are the principal gold-fields in Victoria. The richest district lies at the foot of **Mount Alexander**, about 70 miles to the north-west of Melbourne; and **Ballarat**, a little further to the south, is

also the centre of a rich gold-bearing region. It is thought that coal and copper may also be found in this colony; and the quarries of limestone, sandstone, and granite are almost inexhaustible.

The climate of Victoria is similar to that of England, though warmer; the annual amount of rain is about the same. The soil is light and sandy, and more suitable for pasturage than agriculture. Hence, sheep-farming is carried on to a great extent, and the amount of wool annually exported to England exceeds that from New South Wales. The vine also thrives well, and wine is likely to form an important article of export from the colony. The chief export, at present, is gold; the annual produce of which amounts to about £10,000,000. Britain also imports from the colony copper, tallow, hides, and other articles of less value. The total exports from Victoria amount to about £15,000,000 annually, and the imports of British manufactures and produce amount to about £6,000,000.

The population of Victoria amounts to 520,000. The chief towns are Melbourne, William's Town, Geelong, Portland, and Castlemaine. **Melbourne**, the capital of the colony, stands upon the Yarra Yarra, about eight miles from its embouchure in the basin of Port Phillip. The town was founded in 1837, and has already a population of 100,000. The Yarra Yarra is very shallow, and at its mouth stands **William's Town**, where ships receive and unload their cargoes. **Geelong**, the second town in the colony, lies forty miles to the south-west of Melbourne, on an arm of Port Phillip. **Portland**, standing on a bay of the same name, is the chief town in the western part of the colony. **Castlemaine** is the principal place in the gold-mining district of Mount Alexander.

South Australia.—This colony lies to the west of Victoria and New South Wales. It extends from the southern shores of the continent, into the interior, as far as the 26th parallel, and is bounded on the east and west by the meridians of 141° and 132°. The total area

is about 380,000 square miles, and the length of coast-line, 1600 miles. Recently, however, the boundary of this colony has been extended northward; but the extent of newly added territory has not yet been estimated. The coast is, for the most part, low and desolate, and skirted with islands, one of which—Kangaroo Island—is of considerable extent. The indentations are numerous and large, and we may especially mention the Gulfs of Spencer and St Vincent, which are separated by York Peninsula. Port Lincoln, on the western shore of Spencer Gulf, forms a magnificent harbour.

We have already mentioned Flinders Range, which forms the principal mountain-system in this colony. Near the head of Spencer Gulf, a tract runs off to the west, at right angles to this main chain, and is known as **Gawler Range**; none of the summits of this chain, however, seem to exceed 2000 feet. There are a few tracts covered with scrub or brushwood in this colony, and some barren districts entirely destitute of vegetation; but after deducting all this waste, there are extensive districts well suited for pasturage, and large alluvial plains well adapted to agriculture. The chief minerals found in South Australia are copper, lead, iron, tin, and quicksilver, besides granite, slate, and various precious stones. The metals are chiefly found in the mountains which extend along the shores of St Vincent's Gulf. Copper forms the chief export from the colony, and is found principally in the **Burra Burra** mines, which lie about 100 miles to the north of Adelaide. Lead-ore is found abundantly in the neighbourhood of **Mount Barker**, which lies to the south-east of Adelaide.

The climate is similar to that of New South Wales, but the summers are a little hotter: the mean annual temperature of Adelaide is 65°. The annual fall of rain, in this colony, is only 21 inches, but the long droughts of New South Wales are unknown. The principal river, in this colony, is the lower course of the Murray.

The total population of South Australia is about 120,000.

The people are chiefly employed in agricultural pursuits, wheat forming an important article of export to the neighbouring colonies. Great numbers of cattle and sheep are also reared. An extensive trade is carried on with the East Indies, the Mauritius, and the Cape, as well as with Great Britain and America. The chief exports are copper, lead, wheat, wool, hides, and tallow. The imports are principally manufactured goods.

The chief towns are Adelaide, Glenelg, Koorunga, Macclesfield, Port Elliot, and Port Lincoln. **Adelaide** is situated upon the River Torrens, about four miles from its mouth. It is a well-built and thriving place, and has a population of 20,000. The Torrens is only an insignificant stream, unsuitable for navigation; and the capital is connected by rail with **Port Adelaide**, which lies on the shore of St Vincent's Gulf, eight miles to the north-west. **Glenelg** lies to the south-west of Adelaide, on the shores of Holdfast Bay. **Koorunga** is in the neighbourhood of the Burra Burra mines; and **Macclesfield** is situated among the lead mines of Mount Barker. **Port Elliot** stands at the seaward entrance of Lake Alexandrina, and is the outlet of a fine agricultural district. **Port Lincoln** is the chief place in another thriving part of the colony, lying on the south-western shores of Spencer Gulf.

Western Australia.—This colony occupies the south-western extremity of the Australian Continent, including the district west of the 120th meridian, and south of the 30th parallel. The surface is slightly undulating, the principal mountains forming the Darling Range, and the principal stream being Swan River. Coal, as we have already mentioned, is found in this colony, and traces of iron, lead, and copper have been discovered. The climate is similar to that of the other colonies, and is very healthy. The soil is only of moderate fertility, but excellent wheat and potatoes are grown, and the vine, fig, and olive have been successfully cultivated.

The population of Western Australia is about 16,000,

of whom about 1500 are natives. Considerable trade is carried on with the Mauritius, which receives sheep, bullocks, and potatoes; copper-ore and wool are exported to Great Britain. Sandal-wood is also exported in considerable quantities to Singapore and China. The chief towns in the colony are Perth, Freemantle, Guilford, York, Australind, and Albany. **Perth**, the capital of the colony, stands on the northern bank of the Swan River, about nine miles from the sea. **Freemantle**, at the mouth of the river, is the port of the capital. **Guilford** and **York** are small places in the interior. **Australind** stands upon the coast to the southward of Swan River; and **Albany** is situated on the northern side of King George's Sound.

Tasmania, or **Van Diemen's Land**, is separated from Australia by Bass' Strait, which is about 200 miles broad. The island is in form an irregular triangle, the base forming a concave curve stretching between Capes Grim and Portland, and the sides terminating on the south in two points—the South and South-west Capes. From north to south it is about 180 miles in length, and the total area is about 24,000 square miles. The shores of Tasmania are in general bold and rocky, especially on the western side, where the only openings of importance are Macquarie harbour and Port Davy. On the south-east coast there are several important inlets, especially Oyster Bay, Storm Bay, and D'Entrecasteaux Channel.

The interior of the island is very mountainous, a range—which appears to be a continuation of the Australian Alps—running in a zig-zag through the island, from Cape Portland to South Cape, and throwing off spurs on both sides. The average height of this chain, through the greater part of its course, is 3500 feet; and it culminates in **Mount Humboldt**—in the south-west—which has an elevation of 5520 feet. **Ben Lomond**, in the north-east, is 5002 feet in height; and **Mount Wellington**, which terminates an eastern spur of the main chain, rises 4200 feet above the sea. The south-western part of the island

has scarcely yet been explored, but it is thought that some peaks in that part of the country exceed even 7000 feet. The mountains are, in many places, steep and rugged, and in Ben Lomond there is a perpendicular precipice 3000 feet in height; but between the mountains are valleys of great beauty, and in some places there are extensive plains. Among the minerals found in Tasmania may be mentioned coal, which is pretty generally distributed; copper is found near the north coast; iron, lead, granite, and salt have also been met with.

The streams in the island radiate from the centre to the coast, the two principal being the Derwent and the Tamar. The **Derwent** issues from Lake St Clair, and empties itself into Storm Bay, after a course of 130 miles. It receives several feeders, some of which have received the names of Dee, Ouse, Shannon, Clyde, and Jordan. The **Tamar** is formed by the junction of the North and South Esk, and flows northward, emptying itself by a broad estuary into Bass' Strait. Lakes are numerous in the interior, the largest being **Clarence Lake**, which has a circumference of 100 miles, and is noted for its beautiful scenery.

The climate of Tasmania resembles that of the south of England. It is cooler and more moist than that of the Australian continent: the mean annual temperature being about 52°, and the annual quantity of rain from thirty-five to forty-three inches. The vegetation resembles that of Australia, the trees being mostly evergreen, and including eucalypti, or gum-trees, acacias, mimosas, myrtles, and pines; the timber is very valuable. The wild animals, birds, and reptiles are very similar to those found in Australia.

The population of Tasmania amounts to about 90,000, a great portion of whom were formerly convicts. This is chiefly an agricultural colony; all the grains and fruits of central Europe are successfully cultivated. Excellent wheat is grown, and some of it exported. Wool, however, forms the chief export, and next to it is the produce of

the whale-fishery. The imports from Great Britain amount to about £600,000. The chief towns are Hobart Town, Launceston, Georgetown and Port Arthur. **Hobart Town**, the capital of the colony, is situated upon the Derwent, about 20 miles from its mouth; the town is well built, and vessels of the largest size can come up to its wharf. The population exceeds 20,000. **Launceston** stands upon the estuary of the Tamar, and has about 10,000 inhabitants. **Georgetown** stands at the mouth of the same river. **Port Arthur** stands upon a tongue of land, lying to the eastward of Storm Bay, called Tasman's Peninsula.

Each of the six Australian colonies—with the exception of Western Australia—is ruled by a Governor appointed by the Crown, together with a Legislative Council, and an Assembly elected by the colonists. Western Australia has a Governor, but no House of Assembly. The Governor of New South Wales is the Governor-general of all the colonies. There are also two bishops in New South Wales—the Bishop of Newcastle and the Bishop of Sydney—and one in each of the other colonies.

CHAPTER XII.

NEW ZEALAND.—SURFACE AND MINERALS.—RIVERS AND LAKES.—CLIMATE AND PRODUCTIONS.—HISTORY.—SETTLEMENTS.—AUCKLAND ISLANDS.—CHATHAM ISLANDS.—NORFOLK ISLAND.

New Zealand consists of a group of islands lying in the South Pacific. They stretch between the parallels of 34° 20' and 47° 20' south latitude, and from 166° to 178° east longitude. The length of the whole group, from north to south, is about 1200 miles, and the total area is little short of 100,000 square miles. The group consists

of two larger islands and a smaller one, together with a number of adjacent islets.

Surface and Minerals.—The northern island, or *New Ulster*, is of irregular form, consisting of a main body, and four arms, projecting to the north, south, east, and west. The northern arm is almost bisected by Hauraki Gulf on the east, and Symonds Harbour on the west. On the narrow isthmus between, stands the town of Auckland. The eastern arm is a solid compact mass, lying between Hauraki Gulf and Hawke Bay. The third arm forms the southern part of the northern island; and the western arm, though smaller than the others, contains the lofty summit of **Mount Egmont** or **Taranaki**. The total area of New Ulster is about 44,500 miles.

The middle island, or *New Munster*, is of more regular shape. It extends, from north-east to north-west, for a distance of about 500 miles, and has an average breadth of about 130 miles. On the east coast there is a projecting arm termed Banks Peninsula. The channel separating the northern and middle islands is called Cook Strait, and the shores here are rugged and deeply indented. On the south, Foveaux Strait separates New Munster from the smaller island of New Leinster. The area of New Munster is about 54,100 miles; that of New Leinster only 900 square miles.

A range of mountains seems to extend through the three islands, from north to south; and there are also numerous spurs and isolated summits in various parts. In the northern island the central range is known successively—commencing at the north—under the names of the **Rangitoto**, **Rua Wahine**, and the **Tararua Mountains**; but the highest summits appear to lie apart from the main chain. Mount Egmont has an elevation of 8000 feet, and, on the opposite side of the island, **Mount Edgecumbe** towers 10,000 feet above the shores of the Bay of Plenty. In the middle island the great range runs along the west coast, and has an average elevation of 8000 feet, but some peaks are supposed to attain 12,000 or 13,000

feet in elevation. Along the eastern side of this island broad grassy plains extend, many of which constitute excellent grazing districts. Little is known of the interior of New Leinster, but it appears to be mountainous and well wooded.

In all parts of New Zealand are found traces of volcanic agency; and **Mount Tongariro**, which lies between the Rangitoto and Rua Wahine ranges, is an active volcano. The mineral productions of New Zealand are very various. Gold, as well as copper and iron, have been found in the neighbourhood of Auckland. Coal has been found in many places both in the north and middle islands, and building-stones are abundant.

Rivers and Lakes.—The principal rivers are in New Ulster; those of New Munster have only very short courses. In New Ulster the principal streams are Waikato, Wanganui, Manawatu, Wariapara, and Wai-ho or Thames. The **Waikato** issues from Lake Taupo, which is the largest lake in New Zealand, having an area of 300 square miles. On leaving the lake the river runs northward, and, being joined by the **Waipo**, empties itself on the west coast into a fine harbour, after a course of about 170 miles. It is navigable for vessels of 30 tons for a distance of 100 miles.

Wanganui.—This river rises in the neighbourhood of **Mount Ruapahu**, at the northern extremity of the Rua Wahine Mountains, and flows with a general direction to the south-west. The **Manawatu** has its source in Taranaki Lake, at the foot of Tongariro. It flows at first to the south, then, turning to the west, it crosses the central chain, where a depression divides the Rua Wahine and Tararua ranges, and empties itself into Cook Strait, after a course of 140 miles. The **Wariapara** drains a fine valley to the north-eastward of Port Nicholson, and, after passing through Lake Wariapara, flows into Useless Bay, in Cook Strait. The **Thames** flows in a northerly direction, and, after a course of about 60 miles, empties itself into Hauraki Gulf.

There are several lakes both in the north and middle islands; and to the eastward of Lake Taupo are several hot springs, generally of a circular shape. The largest of these is **Lake Roturoa**, which forms nearly a perfect circle, eight miles in diameter.

Climate and Productions.—The climate of New Zealand resembles that of England, but is warmer and more humid. We have already mentioned that the isotherms of 60° and 50° touch its northern and southern extremities respectively (p. 73). The mean annual fall of rain at Auckland exceeds 50 inches, while at London it is only about 20 inches. As a necessary consequence, the climate of New Zealand is remarkably equable. In the northern island snow is rarely seen, except on the mountains, many of which rise above the snow-line. Though rain falls in every season of the year, it is most abundant in the winter months. The climate in all parts of the colony is remarkably healthy, perhaps more healthy than in any other part of the British Empire. Taking some of the most healthy stations of the British army, it appears that the number of soldiers out of 1000 who die annually from various diseases in New Zealand averages only 8·25; while in Australia the average is 11; in Great Britain, 14; the Cape, 15; Malta, 18, and in Canada, 20.

New Zealand, with the adjoining groups of Chatham and Auckland, forms a botanical region distinguished by its ferns and pines (p. 76). Ferns are everywhere abundant, and sometimes attain the height of 30 feet, displaying great elegance of form. The roots of several species are eaten by the natives; but, upon the whole, the vegetation of this region is very deficient in food plants, though the fruits, grains, and vegetables of Europe thrive luxuriantly. The pines of New Zealand furnish valuable timber. There are several species, among which may be mentioned the yellow, red, and white pines. The puriri, or iron-wood tree, and the black birch, are also valuable for their timber. Palms are found in the northern part of New Ulster.

The animal kingdom is extremely limited in New Zealand. The islands are included in the same zoological kingdom as Australia, but marsupial animals are not found here. When the islands were visited by Captain Cook, a sort of wild dog and a few rats were the only animals discovered; there are now, however, immense numbers of wild hogs. Song-birds are very scarce, and there are no serpents or venomous reptiles of any description. Fish are abundant both in the rivers and round the coasts; and the shores are also frequented by whales and seals. All common European animals are easily acclimatized.

History.—The aborigines of New Zealand, called *Maories*, seem to belong to the Malay race (p. 86.) They are a tall, well-formed, active people, and the women are often handsome. In natural power of intellect they seem inferior to no European race, and they are decidedly the most promising of all the aborigines with which colonization has brought us in contact. At present they number about 55,000, and by far the larger proportion reside in the northern island; but it is to be feared that the number is rapidly diminishing. Many of them have been converted to Christianity. The first regular settlement of white men was made in 1839. In 1840, New Zealand was constituted a colony, and a governor was appointed; and in 1853, a constitution conferring self-government was granted to the colonists, who at present number about 110,000. Just now a serious war is raging between the natives and colonists, which was owing originally to a dispute about land. It appears that the settlers of New Plymouth—in the neighbourhood of Mount Egmont—wished to purchase a piece of land in that neighbourhood. A native named Teira was willing to sell it; but William King, the chief of the tribe, denied his power to do so, and refused to give up the title. This has given rise to an expensive war, and it is to be feared that, on the part of the colonists, it is not a very just one. The natives are jealous of their land, which is gradually passing from

them into the hands of the English, while the settlers do not appear over scrupulous as to the means adopted for obtaining possession of it.

Settlements.—New Zealand is divided into nine provinces or settlements, each of which has a Superintendent and Provincial Council: we shall give a brief description of each.

Auckland.—This province includes the northern portion of New Ulster. The climate is very warm, and the soil is well suited for agriculture. Valuable forests of kauri, or yellow pine, still exist. A large number of natives belong to this province. The town of **Auckland**, situated on a narrow isthmus, is the seat of government for the entire colony. **Kororarika**, on the Bay of Islands, is another flourishing settlement.

New Plymouth.—This settlement, situated at the northern side of Mount Egmont, has been termed the Garden of New Zealand. The country is exceedingly picturesque, and the soil fertile. The chief defect of the settlement is the want of a good harbour.

Wellington, upon the eastern side of Cook Strait, was the first settlement in New Zealand. The town lies on the western side of Port Nicholson, which forms a magnificent harbour. About 100 miles to the north of Wellington stands the town of **Wanganui**, on the river of the same name.

Hawke Bay.—This province was formerly a part of Wellington, but was separated from it in 1858. It embraces a portion of the eastern side of the island; the capital of the settlement is **Napier**. The climate is delightful, the soil fertile, and there are numbers of sheep and cattle. There are about 2000 settlers, and about 4000 natives in this province.

Nelson.—This and the remaining provinces, are situated in New Munster. Nelson province embraces the northern portion of this island—the town of **Nelson** standing on an inlet of Cook Strait, called Blind Bay. The land is here not so good as in some of the other provinces;

but there is an abundance of minerals, including coal, copper, and gold, and many excellent harbours. The climate also is very agreeable.

Marlborough.—This province lies to the west of Nelson, and occupies the north-eastern extremity of Middle Island. The surface is very diversified and well-watered, and the chief settlements are at **Pieton** and **Blenheim**, the former on Queen Charlotte Sound, the latter on the River Wairau, which empties itself into Cloudy Bay.

Canterbury.—This settlement embraces an extensive tract of country in the neighbourhood of Banks Peninsula. The country is in general level, and constitutes an excellent grazing district. There is an absence of wood, but plenty of water. **Christchurch**, the capital of the colony, is an inland town. **Lyttelton**, the port of the settlement, stands on Port Victoria, on the northern side of Banks Peninsula.

Otago.—This province is situated in the south of New Munster. It was colonized by a body of Scotch emigrants in 1847. There are some fine pastoral districts, and large tracts of country well wooded, which, if cleared, would be well adapted to agriculture. Port Otago is an extensive inlet, at the head of which lies **Dunedin**, the chief town in the settlement. The discovery of gold in this province has caused a great influx of settlers.

Southland.—This province lies at the southern extremity of Middle Island, and is surrounded on three sides by Otago. It is bounded on the east by the Mataura River, and on the west by Waiau. The chief settlements are **Invercargill**, on a fine inlet called Lower Harbour; and **Riverton**, at the mouth of Jacob's River.

It will thus be seen that New Zealand offers a fine field for emigration, possessing, as it does, nineteen million acres of good land, with a population of not two to a square mile. The chief exports from the colony at present are wool, the produce of the whale-fishery, copper-ore, grain, and potatoes; but it possesses every facility for becoming "the granary, dairy, and orchard of the South Pacific."

The imports of British produce and manufactures amount to nearly £700,000.

The **Auckland Islands** constitute a group lying about 180 miles to the south of New Zealand. The largest of the group is called Auckland Island; it is about thirty miles long from north to south. The highest point in the group is **Mount Eden**, which has an elevation of 1350 feet. The islands are covered with vegetation. "A low forest skirts all the shores, succeeded by a broad belt of brushwood, above which, to the summit of the hills, extend grassy slopes." There are no land quadrupeds except the wild pig; but birds are numerous. The islands are often visited by ships engaged in the southern whale-fishery, and are admirably suited for a whaling station. There is an excellent harbour on the eastern side of Auckland Island called *Rendezvous Harbour*.

The **Chatham Islands** consist of a group of three islands, lying about 350 miles to the eastward of New Zealand. Chatham Island, the largest of the three, is about 90 miles in circumference, and is clothed with verdure. The soil is very fertile, and produces excellent potatoes. The present population consists chiefly of New Zealanders; the native race—a cheerful, good-natured people—being nearly extinct. The harbour of *Waitangi*, on the western side of the principal island, is much frequented by whaling vessels.

Norfolk Island is a small island about 15 miles in circumference, lying 400 miles north-west of New Zealand. The island is generally level, the highest elevation—**Mount Pitt**—rising only 1050 feet above the sea. The climate is very agreeable, and the soil exceedingly fertile. The Norfolk pine is the characteristic production, but wheat and maize grow in great abundance. Birds are very numerous, including pigeons and parrots. The approach to the island is rather difficult on account of a

heavy sea which constantly breaks upon the rocky shores. The descendants of the mutineers of the ship "Bounty," who settled in Pitcairn Island in 1789, were removed to Norfolk Island, with their own consent, in 1855. They numbered at that time about 160 persons.

THE END.

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